JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

3rd Series No. 3] JANUARY 1945 [Vol. 52

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Journal

THE ROYAL GOLD MEDAL 1945

The President has received the following telegram from Academician Victor Vesnin in acceptance of the Royal Gold Medal, 1945:

Dear Mr. President,—I beg to offer you as President and to the Council and Members of the R.I.B.A., my sincerest expressions of gratitude for the great honour conferred on me by the award of the Royal Gold Medal for 1945. In this act I envisage not only such high appreciation in recognition of my modest efforts in the field of architecture but also a symbol of the further promotion of creative co-operation between architects in Great Britain and the Soviet Union. Please convey to all architects in Great Britain my best wishes for continued progress in this New Year of 1945. Sincerely yours,—VICTOR VESNIN.

NEW YEAR HONOURS

Outstanding among the New Year Honours is the Knighthood awarded to Professor Patrick Abercrombie [F.], Town Planning Consultant for the County of London, for the Greater London Region, for the Clyde Valley, Plymouth and Hull.

Other honours of interest to members are the following: The Rt. Hon. Lord Portal [*Hon. F.*] has been created a Viscount; The Rt. Hon. Lord Reith [*Hon. F.*] has been awarded the C.B.; Dr. R. E. Stradling, F.R.S. [*Hon. A.*], one-time Director of Building Research and Chief Adviser of the Research and Experiments Branch of the Ministry of Home Security, and now Chief Scientific Adviser to the Ministry of Works, has been knighted.

The O.B.E. has been awarded to Mr. C. H. Walker, M.C. [L.], and Mr. S. N. Cooke [F.] and Mr. H. H. Reid [A.] (Ceylon) have been awarded the M.B.E.

The C.B.E. has been awarded to Mr. Edward Barnsley, designer and maker of hand-made furniture, to Mr. J. P. Bushe Fox, F.S.A., Chief Inspector of Ancient Monuments, Ministry of Works, and to Mr. H. Ovenden, F.S.I., Chief Technical Adviser, War Damage Commission.

INFORMAL MEETING

Mr. GOODHART-RENDEL ON SIR EDWIN LUTYENS

An Informal Meeting will be held at 5.30 on Tuesday, 13 February, when Mr. H. S. Goodhart-Rendel [F.], Past President, will read a paper on the work of the late Sir Edwin Lutyens.

M.B.E. FOR SERVICES TO THE HOME GUARD

Major A. S. Burnett [A.] and Major R. W. H. Vallis [F.] have been awarded the M.B.E for their services to the Home Guard.

MEMBERS OF THE R.I.B.A. AND PRACTICE UNDER TRADE NAMES

At the request of the Council, the Practice Committee have given consideration to the question of the practice of some members of the Institute of forming partnerships and practising under trade names and not under their own names. The Practice Committee were authorised to take evidence, if necessary, and they have discussed the matter with members who are or have been practising under trade names.

The Council are in agreement with the views expressed by the Practice Committee that while the position is not covered by the Code of Professional Practice, it is undesirable and not consistent with the dignity of the profession for members of the R.I.B.A. to engage in practice under trade names or names having the semblance of trade names.

This does not mean that the Council are opposed to group practice. They are of opinion that many advantages may be gained by a number of architects forming an association or group either with or without other specialists, but they feel it is desirable that in such a case the term "Associated Architects" should be used, preceded by the names of the individuals making up the partnership or group.

MEMBERS SERVING WITH THE FORCES

KILLED

Pratt: Francis R. [S.], Midshipman, R.N.V.R.

MISSING

Halliday : J. L. [*A.*], Flying Officer, R.A.F.

PRISONERS OF WAR

Koerner : Alfred [*L.*], who became a Prisoner of War in 1940 was released on 25 August 1944, when the Germans left Paris.

Foulkes : Ralph Colwyn [*Probationer*], Lieut. Recce Corps, 1st Airborne Division, reported missing at Arnhem, is now reported a Prisoner of War.

DISTINCTION

Bell : Wilfred [*L.*], Lieut., R.E., Mentioned in Despatches.

NO LONGER IN THE FORCES

Hyett : F. L. [*L.*], Lieut., R.E.

Rowntree : Colin [*F.*], Capt., R.E.

Wark : W. R. [*S.*], Major, R.E.

Demobilisation and Post-War Employment

R.I.B.A. INDEX—QUESTIONNAIRES A AND B

All Members, Students and Probationers of the R.I.B.A. are reminded that if they have not already done so, they should complete their copies of Questionnaire A and/or B, and return one copy as soon as possible to the R.I.B.A.

Probationership and the Forces Preliminary Examination

The Council of the R.I.B.A. have decided to include the Forces Preliminary Examination in the list of examinations recognised for the Probationership of the R.I.B.A.

The Forces Preliminary Examination has been instituted by the Education authorities of the Forces to enable men and women who will still be in the Forces to gain a certificate of general education.

Messages from France and Belgium

The International Reunion of Architects

"The Central Committee of the International Reunion of Architects meets again for the first time in liberated Paris under the Presidency of Mr. Auguste Perret.

We pay sorrowful tribute to our members who have died in the cause of liberty on the battlefield, and in the camps and jails of the oppressor.

We send our deep sympathy to those members still fighting on the war fronts and in the underground movements for the deliverance of their countries, both in Europe and the Far East, as well as to those waiting their deliverance from prisons and concentration camps.

We express to all the United Nations' sections of the I.R.A. our feelings of gratitude and brotherhood.

We tender our thanks to our friends in neutral countries for their active sympathy and we hope that in a world freed from the nightmare of tyranny and oppression it will soon be possible to enjoy once more intellectual, artistic and professional intercourse between all peoples who are moved by like ideals."

From S.A.D.G.

The President has received the following message from M. Jacques Duvaux, President of the Société des Architectes Diplomés par le Gouvernement :—

Paris.
le 21 Septembre 1944.

Le Président de la S.A.D.G. adresse au nom de la Société tout entière son plus affectueux message à son Confrère Percy Thomas, Président de l'Union Franco-Britannique des Architectes.

Il tient à lui exprimer toute notre profonde reconnaissance pour l'appui fraternel mais décisif apporté par l'Angleterre en guerre au peuple de France pour sa libération totale et définitive.

C'est dans cet esprit et dans le désir de reconnaître, si peu que ce soit, l'immense dette contractée comme l'amitié qui les a toujours unis, que le Président insiste pour qu'il soit porté à la connaissance de tous les Architectes Anglais que la S.A.D.G., comme les familles de ses membres, leur sont ouvertes de tout cœur.

Le Président de la S.A.D.G.,
JACQUES DUVAUX

From Belgium

The following message has come from La Société Centrale d'Architecture of Belgium :

Bruxelles, le 21 Septembre 1944.

à Monsieur le Président du
Royal Institute of British Architects,
Portland Place,
Londres.

Monsieur le Président et cher Confrère,

La Société Centrale d'Architecture de Belgique, Société Royale, après la libération de Bruxelles, tient à adresser à ses confrères anglais, et par leur intermédiaire à l'armée britannique tout entière, l'expression de sa plus grande admiration pour les exploits incomparables qu'elle a accomplis et grâce auxquels la Belgique doit d'avoir recouvré son indépendance.

Du fond du cœur, tous les membres de la S.C.A.B. vous expriment leur profonde gratitude et en celà ils ne font que prendre part au sentiment unanime de leurs compatriotes, sentiment dont l'accueil réservé aux magnifiques troupes du Maréchal Montgomery a été l'éclatant témoignage.

Espérant que bientôt nous aurons l'occasion de vous dire de vive voix l'inaltérable sympathie que nous ressentons à votre égard, nous vous prions de recevoir, Monsieur le Président et cher Confrère, à l'assurance de toute notre amitié et de notre entier dévouement.

Le Secrétaire,
AXEL-W. LEMESRE.
Le Président,
ALEXIS DUMONT.

The President replied as follows :—

17 October 1944.

Monsieur le President de la Société Centrale d'Architecture de Belgique,
Hotel Ravenstein,
Bruxelles.

Dear Mr. President,

I was delighted to receive your letter of 21 September and to know that the Société Centrale d'Architecture de Belgique has survived.

We are full of gratitude that Belgium has been liberated and it is a particular source of pleasure to us to know that the British Army, under the brilliant leadership of Field-Marshal Montgomery, have had such a large share in this noble feat.

May I express my sincere good wishes and those of the whole of the members of the Royal Institute of British Architects for the future prosperity of the Société Centrale, and I hope that in the very near future we may have the pleasure of welcoming you and your colleagues to this country and renewing our old associations.

With kindest regards,
I am,
Yours sincerely,
PERCY THOMAS,
President.

Books and Greetings from the Architects of the Soviet Union

The British Council, which has been acting as intermediary between the R.I.B.A. and the Academy of Architecture in Moscow, has recently been in communication with Mr. Alabyan, the distinguished architect and Vice-President of the U.S.S.R. Academy. Mr. Richard Seymour, of the British Council, has communicated with the R.I.B.A., saying that the Council had presented certain books to Mr. Alabyan for the Academy of Architecture, who replied that they in return were sending a number of their publications for presentation to the Royal Academy and the R.I.B.A. The Academy of Architecture sent its best wishes to the architects of Great Britain, "with whom," the message ran, "we are linked not only by common professional interests but also by the singleness of the great tasks for which both our peoples are waging a selfless struggle against barbarous Nazism, the enemy of all culture and progress."

THE ARCHITECT AND ORGANISATION OF POST-WAR BUILDING

T. P. BENNETT, C.B.E. [*F.*]

A PAPER READ AT AN INFORMAL GENERAL MEETING AT THE R.I.B.A. ON TUESDAY, 12 DECEMBER.

THE PRESIDENT IN THE CHAIR.

As the President has already said, I had the honour of speaking to the Institute about a year ago on what was virtually the same subject as that on which I am addressing you this evening, and when the Council asked me to speak again this year I felt that implied in their request was a desire for me to describe in detail the application of the principles which I discussed a year ago and to show how they might be carried out in the offices of architects as part of our post-war building obligations.

The Operation of the Profession

That task is by no means easy, as the profession to-day is divided into a greater number of categories than perhaps at any previous time in its existence. There has been in the last twenty-five years a tendency to a certain measure of specialisation, and there has been a very large increase in the number of official architects employed by counties, by boroughs, by the Ministry of Works and by Industrial Departments. Therefore, in speaking of organisation at the present moment, one has to endeavour to visualise those means of operating the profession of architecture.

Widening Range of Building

We all start out, as we should do, with the firm conviction that we are following a fine train of artists who have designed the great buildings of the world. When we come to consider our own conditions of living, we realise that we are also asked to provide buildings for an ever-widening public. In most previous periods of architecture the buildings were mainly provided for great organisations like the Church or great families like the Medici and the great families of England, or, in more minor work, for people of some substance like lords of the manor. Our problem to-day is entirely different. In some respects it reflects the problem of other industries, such, for instance, as that of the industry in which the carriage, which was once the prerogative of the few, has turned into the motor car, the prerogative of the many. That has carried with it the uncomfortable atmosphere in which buildings are constructed as we know them to-day. Whereas in most former periods the result was almost the only thing that mattered and in very many cases the cost and, perhaps to a still greater extent, the time were of very minor importance, now we are faced with a condition of living in which neither the cost nor the time, in the great majority of cases, can be subordinated to or separated from the result. We therefore live, I think, under different architectural conditions or different social conditions from those which obtained in former periods, and, whereas a few may be privileged to design buildings in which quality and result are still the outstanding or indeed the only considerations, the great majority of us have to work under conditions in which the quality and the architectural effect are only two of the things with which we are asked to deal. Moreover, we live in a period in which constructional method and the application of science to buildings have impinged upon construction so rapidly and so extensively that no kind of empirical experience is sufficient to guide us in carrying out a very large portion of our work. We have been led to use science more and more in our buildings and therefore have been driven either to use that science successfully ourselves or to employ specialists to use it, and, if the latter, to co-ordinate those specialists into one cohesive whole.

Conditions of Work not Stabilised

It may well be that when we have experienced these conditions for some time, particularly if they remain stable for another twenty or thirty years, we shall have automatically acquired a means of coping with them, but to-day they are new and surprising, and added to them we have another. We have the development of education amongst our clients, and, our clients being an ever-increasing proportion of the population, we are faced not merely with people whom we advise as all-wise and all-seeing architects but with people who are prepared to argue with us upon the appearance, construction and equipment of many portions of our buildings. I suppose it is safe to say that the great designer of any period to a very large extent tells his clients what they are to receive. It is also true to say that that privilege is accorded to the few and not to the many, and therefore most of us have to justify ourselves on every individual building.

Groups of New Clients

I also feel that as architects we are going to meet a set of clients in the post-war period who will be new as clients. All of us in our own practices have experienced the difficulty of the man who for the first time becomes the client of an architect. He fails to grasp the very long period of preparation that is necessary. He fails to visualise the big mass of detail upon which he must make decisions in the intangible period of the early sketch plan. He fails to think of all the things that he thinks of as he sees the building grow underneath his observation. Therefore every architect dealing with a man who is an architect's client for the first time tends to experience that disaster to organisation, the constant alteration, the constant fresh idea, the constant change, which demolishes any really good method of putting the building together.

Committees and Standards

It is obvious that much of the work of this country is going to be carried out under the control of committees of various kinds. We are going to have committees for housing, committees for hospitals and committees for schools, and we are going to have national standards laid down for a great many of the buildings, because they will be subsidised wholly or in part from public funds. We shall therefore have a certain advisory function to perform, to instruct the people who prepare the conditions of the building, the standards of housing, the standards of schools, and so forth, and we shall have to deal with committees that will give us instructions upon the application of those principles once they have been formulated.

The Client Cost and the Industry

It therefore seems to me that as a profession it behoves us to study this question of the client in a way that has never been necessary in any previous period, and, if that is the case, we have to start by building a machine which will cope with the client. In addition to that, we have to build a machine which will cope with the advance of science both in the structure and in the equipment of buildings. We have to build a machine which will deal with the high cost of building compared with the average income of the user of the building. In almost every structure cost is going to be of extreme importance, both the forecast of the cost and the actual final cost. We shall have to deal with an organisation in which labour is scarce and must be employed to the utmost capacity. We shall have to work in a period of 100 per cent. employment, when the former incentive to work, good or bad, that is, the "fear of the sack,"

the fear of a cessation of income, will disappear, and we shall have to put in its place some other incentive to work which will produce reasonable production from the big body of workpeople. We shall have to deal with an industry, in other words, in which an entirely new set of conditions must of necessity arise, and we should therefore begin, I think, by visualising the machine of building as it is to-day. What is the organisation which will bring into existence the designs which between us we produce?

Contract Organisation

I have prepared this diagram to show the organisation of the building contract as I understand it. As you see, I have started with the client. The client instructs the architect, but he instructs him not with a precise tabulated statement of requirements, as perhaps he should do, but with a vague desire to possess a building, or he approaches the architect with the set of basic conditions laid down by the Ministry of Health for housing or for hospitals or by the Board of Education for schools. Like all such conditions in this country, those conditions are purposely laid down to leave the maximum of choice to the individual. If I may be permitted to be personal for a moment, I have been very much impressed in my war-time position as Director of Works to see the extent and the power of the local authorities of this country, the choice which is still permitted to them, in spite of direction from the Government, and the unmistakable way in which they exercise their power. Therefore, when the individual architect is asked to design in accordance with those conditions, he finds at once that there is much choice left to the individual committee or the individual local authority or indeed to the individual owner who wishes to build in accordance with the minimum requirements of housing as laid down by the Government for the time being, and so he starts, first, with certain guiding principles, and, secondly, with a wide choice.

Precise Instructions

I feel, therefore, that all of us must set up within our offices some organisation which will force our clients, whether individuals or committees, to lay down precisely what it is they are asking us to design, and then we must have some means by which they can learn precisely what we propose to give them in response to their invitation. We discover in many cases that neither the individual nor the committee is able to grasp the purport of an architect's drawings, however clearly laid down. It is surprising on occasion to discover that a well-educated and capable individual, having many extremely good qualities of education, does not grasp a building in two dimensions although it is shown as clearly as it is possible to show it. By the help of perspectives we try to impress upon such people something of the probable appearance. By the use of able draughtsmanship we try to disguise the errors which we believe to have crept into our elevation, and we balance the lack of balance by stopping motor cars in precisely the right place, and things of that kind, but nevertheless from a really practical point of view we do run the risk of leaving our clients without a precise knowledge of what we are offering. In the same way, the details of the plans, the number of lavatories provided, the floor space given to gymnasia, the amount of lighting compared with floor area and a great many other perfectly obvious things, do not reach their inner consciousness at all. Moreover, what is true of an individual is also true of a committee. Therefore I feel that the first machine which the post-war architect must endeavour to perfect is one which will convey to his client precisely what he believes to be that client's instruction. He can do that most readily—and, in fact, must do it to begin with—by the sketch plan, the elevation and the perspective. There is no other means by which we can convey ideas in buildings from one mind to another. The client's complete requirements can be fully appreciated only by setting them out in the schedule and by asking questions and typing and sending back the answers in what I have called the questionnaire.

Therefore I should like to suggest first of all that in every practice, large or small, in the borough, the county or the municipal office, the requirements should be formulated and the precise approval of those requirements by all parties should be obtained as a piece of organisation deliberately laid down as a necessity before the commencement of the sketch plans of the building. Once those requirements have been formulated and approved they should be adhered to by all parties. It is not waste of effort—indeed, it is the negation of waste; it is of the greatest advantage to all concerned—to arrive at that position of clarity at the very commencement.

Having dealt with the client as meticulously as may be, we next have to face the situation of the complication introduced into the construction by the advance of science in building. In order to cope with that situation we have set up a number of professions (or they have set themselves up) which impinge upon architecture.

Consultants

The first of those professions is that of the quantity surveyor, who has become part and parcel of the building machinery of this country and who I think to-day is an essential part of that machinery. As architects we have, I think, to make more and more use of the quantity surveyor from the very earliest stages of our design, and the profession of the quantity surveyor should therefore be the first of these subsidiary professions (if we may call them that) to be called in to lend assistance to our offices in producing our buildings, judging those buildings now from the point of view of organisation. Therefore the next step that we need is an accurate estimate of cost.

Accurate Cost

I think, in the first place, it is a disaster that the public have come to regard these early estimates of cost as entirely unreliable, and, in the second place, I think that their unreliability is quite unnecessary. Within a reasonable margin of error it is possible in the early stages to give a client a very clear idea of what his building ought to cost. We might well say: "Why, then, has this wide discrepancy occurred?" and I think that, at the risk of being perhaps tedious in detail, one should examine the reasons for the discrepancy.

I am sure that the first reason is the absence of a definition of the requirements of the building owner. He has said: "I want a building" and the architect has said: "Here is a building," and somebody has said: "A building of this character will cost this amount of money." That is quite insufficient as the basis of accuracy. If we leave for a moment the profession of architecture and the industry of building and think of another industry. No one puts a motor car on the market with that amount of lightheartedness with regard to its cost, and, if a factory-produced article like a motor car cannot be put on the market with that lightheartedness, still less should such lightheartedness be shown in the case of elaborate things like buildings. Therefore we must couple up the fixed, obvious and known requirements of the client and the precise method the architect has used to meet them with the possibility of securing a precise estimate of cost. We might put down, therefore, the first error in the past as a lack of clear requirements on the part of the client.

Secondly, there is the lack of clear knowledge of the site conditions. It is not always possible to have such knowledge in the early stages of design, or even in the later stages; therefore this is one of the items upon which some contingency is a necessity, but the exercise of proper judgment, examination by trial holes, and so forth, should normally produce a contingency which is within manageable proportions. It may be that we strike disasters of foundations of wide variation in character. We may strike disasters of various kinds which upset the very best calculations, but those cases are rare and they must perhaps at times be accepted.

The third reason for not having accurate costs is that we ourselves have kept incomplete records of former costs, and the fourth is that the quantity surveyors in a great many cases have a very hazy and incomplete idea of costing, with the result that their figures are in themselves unreliable. I have come to the conclusion that mere cubing is an unreliable method but an excellent general guide. Everyone has had experience of the

experienced architect's cube being more accurate than the quantity surveyor's rough quantities, and our well-tried basic method of arriving at cost is therefore still a basic method by no means to be disregarded, but the science of estimating has to travel a great deal farther than it has in the past. In all staple industries there is a first-class elaborate system of costing constantly in progress. If we were producers of factory articles we could possibly set up some such system of costing and arrive at a point at which we knew almost exactly what any process would cost, but building, apart from not being an exact science, also suffers from the defect (if one may call it so) that it deals with such a diversity of products that at first sight it appears to be far too wasteful to cost them in the accurate manner of the industrialist. We cannot accurately compare the cost of St. Paul's Cathedral with the cost of the town hall of some local authority, and to that extent the industry has been frightened of systems of costing. I am sure, however, that the time has arrived when one of the things we ought to expect from our quantity surveyors is a real knowledge of the cost of works and not a knowledge obtained by taking six tenders and dividing the total amount by six to give the unit cost. That is only multiplying the errors of the builders in estimating, and in the building industry there has been the same kind of looseness on costing as has obtained amongst quantity surveyors and architects. It is a fault which has run through the industry from top to bottom. Loose costing must disappear. If we are to have specialists, the specialist whose duty it is to deal with accurate costing is the quantity surveyor or, in the offices which do their own quantities, the quantity surveying department, and it must be regarded as one of the essential overhead costs of the quantity surveyor that he constantly checks his costs against the actual cost of work and does not merely compare tender prices. I think in that respect we ought to endeavour to follow one of the practices of civil engineers. The civil engineer may at one time be in a professional office and at another period in his career he may be on a contractor's organisation. The quantity surveyor, if he adopted a similar practice, would have some knowledge of costing from the builder's point of view and some knowledge of costing from the architect's point of view, and under those conditions I think we could produce an accurate estimate.

Engineering

We pass next to the consideration of the means by which we should apply the science of structure to our structures and the science of heating, electricity, and so on, to our equipment. Here we come to the next biggest difficulty of the profession. It is obvious that the smaller works, on which so many of us are of necessity engaged, do not justify—or at any rate the public has not been taught that they justify—the employment of four or five men to exercise professional skill upon the various sections of the work. It does not appear possible, in the case of a small building, to employ a consulting engineer to design an electric lighting scheme which costs £80, yet the proper method undoubtedly is to have that small electrical system designed by means of a professional brain, and in larger schemes it becomes more and more a necessity to employ a specialist in electricity to design the electric lighting. What is true of electric lighting is true also of heating, steelwork, reinforced concrete, lifts, acoustics, and so forth. In the case of large buildings there may be anything up to forty sub-contracts upon which in one form or another we employ a specialist. The profession therefore has to meet this exceedingly difficult condition of working, whether applied to the small office of the single architect with one assistant or to the Ministry or to the large private office or to the borough architect's department. I think that this kind of complication is probably one of the reasons why the department has grown as opposed to the private practice. It is realised that a modern building is the product of many professional brains and not only of one. It is equally true that we cannot produce a good entity unless we have one controlling brain, and I think all of us still consider that that one controlling brain should be the brain of a man with an artistic outlook and a sensitive feeling for the needs of the community, for the right use of materials and for the beauty of the countryside or the grandeur of the city, and we still believe that that man is the architect as he ought to be in modern civilisation.

Architectural Control of Engineering

If that man is to be the architect (and I feel it is a warning to us that I am bound to say "if"), he cannot control the elaborate and difficult team of men that he may have under him unless he has some qualifications to direct them, and he can have qualifications to direct them only if he possesses three characteristics. The first is artistic capacity, which is his very existence. The second is sufficient knowledge of the guiding principles of the application of science to the various parts of buildings to know exactly what advice he is receiving, to exercise technical judgment upon it and to use it or disregard it as his judgment dictates. That judgment must be judgment born of some measure of knowledge. Thirdly, he must have sufficient organising power to be able to make that group of men into a team with one object, namely the completion of a fine building.

We have to deal with these various factors of buildings, first of all with the tiny office, the one-man office, secondly with the large office and thirdly with the department.

If we think of dealing with them through the one-man office, then that one man may well have to carry out all the professional work which the building demands. That brings us back to considerations of architectural training, which I venture to suggest are more complicated and difficult than ever before. It may be that the exclusive concentration of architectural education upon the design period, the history of architecture and the social qualities of buildings, by which so much of our time as students is absorbed, is a distribution of effort which is no longer possible. It may be that some of the time will have to be entirely differently spent. It may be that we ought to have some measure of scientific background for the architectural student before he enters upon his course of education. If that is not possible in every case, we must visualise the specialisation of architects at a very early stage, leading towards the artistic aspect of architecture or the practical aspect of architecture, with a view to ultimate association in the form of partnerships, but that we can no longer disregard the need for having a measure of knowledge of these other branches of building is becoming, I think, more and more evident. If, therefore, we approach the educational problem with that idea in mind and if it comes to the worst and we have to throw overboard the study of the history of architecture, except as an academic accomplishment, that may well be merely facing the conditions as they exist to-day. It may well be that the architect who aims at practice of a really personal character, with a small staff and dealing mainly with buildings of small size, ought to know enough of the elements of electricity to design the lighting scheme and enough of the elements of heating to design the heating scheme and enough of the elements of steel and concrete for simple application. Therefore we must consider architects of that character in the future as men equipped with a certain amount of knowledge of several sciences.

We must then think of the scheme as it grows, and there comes a point at which it is obviously impossible for any one man to have the knowledge needed for more than one side of the work. If he decides, as he should do, to remain the designer and the planner of the building, he must engage other minds to do the rest of the work, and they must be minds with a real knowledge of the direction which he is endeavouring to give. That direction once given, the detail (if we may call it detail) can be carried out in several ways. The practice has grown up of having a nominated contractor, a contractor who has developed a design side to his business and undertakes to design to the architect's requirements. It is easy to say that the client does not pay an architect to employ a contractor to design the work. It is less easy to see the precise answer, because in many cases that specialist contractor has specialist plant and specialist workmen. In many cases he has developed his design to suit his plant and his workmen, and if he is forced to work to other designs there is loss in the efficiency of his plant and his workmen. Therefore in many cases we need the benefit of that particular kind of

professional direction which is associated with a particular firm, and so we look to alternative methods by which the design can be created. It is obvious that a small office cannot hope to maintain on its staff specialists in steel, heating, lighting and so forth, but must look to other professional men to provide it with the knowledge required. I think it is obvious that it must at least have professional men to design the structure, and it is nearly as obvious, I think, that it must have professional men to design its heating, its lighting and its sanitation. The small office and sometimes the large must find suitable men to operate with it in the form of consultants.

The Cost of Control

Owing to the growth of the sub-contractor-designer, we have allowed the public to get the idea that, broadly speaking, we can design any building for 6 per cent. and for that percentage secure the skill of all the professional men that are needed. We have, I believe, slowly (although it has been many people's practice throughout), taught the public that it has to pay the quantity surveyor an additional fee. We have not yet taught the public that it has to pay the consultant an additional fee, and, so far as my own experience goes, it is quite impossible to employ a consultant on all the work for which a consultant should be employed, which means in big buildings a minimum of 30 per cent. of the work, if not 40 per cent., and give the architect only 1 per cent. on that portion of the work, because, if he does his own job properly and co-ordinates all those people and incorporates all their work in his drawings, as he should do, he will find that it costs him a great deal more than the remaining part of his fee to do the work. Therefore, if we are to employ consultants and pay them consulting fees we have to educate the public to the fact that, when a building requires a heating engineer for its heating scheme, it is not an answer to employ a heating consultant at 5 per cent. or 6 per cent. and pay the architect 1 per cent. on that portion of the work and omit it from the contract. If the architect does his work properly he will spend at least three times his 1 per cent. on seeing that the various details of the heating scheme are in the best interests of his client, locating the boiler-house, receiving the drawings of the heating scheme, arranging for the fixing of the boilers and the pipes, and so forth, dealing with all sound-deadening appliances that are necessary and the hundred and one other adjuncts of heating which are needed if his client is to be properly safeguarded. Therefore wrapped up with the question of the employment of a heating consultant is the question of the payment by the public of the fees for that consultant and, as soon as we can obtain real confidence in the architect's control of building and all its adjuncts, the public will be perfectly willing to pay a proper charge for the services which they receive.

Alternative Methods of Control

There remains one other method of dealing with the consultant, and that is the employment of a specialist on the staff of the architect. That, I am sure, will have to be faced more and more in architectural practices in the future. It tends to the type of practice which this country has not received with open arms, that is, the larger practice, where a measure of personal touch with every part of the building is not maintained, the type of practice which has developed of necessity in a new country like America. I believe it is true that there are more firms of architects in England than there are in America, in spite of the difference in size and population. I am open to correction on that, but, at any rate, the average office in America is of a larger size than the average office in England, even allowing for the difference in the magnitude of the work. In other words, America has faced the problem of the specialist rather more freely than we have been prepared to face it here.

Finally, there is the architectural partnership, in which one man is above all the artistic designer and planner and the others are above all the constructionalists or the equipment engineers.

The same sort of problem applies to the departmental architect, and in this case again many of the difficulties of control by the architect appear in almost exactly parallel form. The specialist office in the public department tends more even than in private practice to take control of the architecture, and, unless the architect is capable of directing, the engineer refuses to be directed and in fact becomes the director, and he designs the steel frame and says to the architect: "There you are; that is something like your plan; it is a little bit like your elevation; but you will have to move the windows. I do not suppose it will make any difference." Then we do not get unified control by the architect, which is what we desire, but we get sub-divided control by the individual department. Then the heating engineer comes along, a man of substance and knowledge, concerned mainly with heating and ventilating, and he dictates the position of the radiators and boilers, and further undermines the control of the architect. It is true that he is the only man in those conditions who can lay down the mathematical requirements of his piece of equipment, and, if there is not knowledgeable control by the architect, the dictation of the heating engineer is accepted. If, however, there is knowledgeable control by the architect, a position is established in which the requirements of the heating engineer are efficiently married with the final architectural treatment of the building. That, I think, is the only state of affairs which we as architects should recognise as possible, but it can be achieved only if the architect himself has the requisite knowledge to talk with sense and understanding with the specialist departments under his control.

Sub-Contractors

We now come to the question of the sub-contractors. It is quite obvious that one of the worst features of our contract arrangements to-day is our method of employing our sub-contractors. It is a strange fact that, in spite of the growth of sub-contracting, we have no R.I.B.A. form of sub-contract which is universally employed, and, in fact, on a great many of our contracts it is safe to say that few of us know the precise contractual arrangements between contractor and sub-contractor until we have a legal dispute of some kind or other. That applies also to the methods by which we obtain our tenders and the methods by which we insert them in the contract, and, in fact, to a great deal of the procedure which exists in a great many offices throughout the country. When we go to tender on a sub-contract we ought always to issue a copy of the conditions of contract which we intend to use for the main contract; we ought always to issue a list of the duties which the main contractor will perform for each sub-contractor; we ought to lay down the conditions for the provision of scaffolding, the provision of latrines and office accommodation, and the provision of the canteen for the sub-contractors' workmen, and the conditions under which the sub-contractor is going to work. On the other hand, we ought to lay the obligation upon the sub-contractor to fit in his programme with that of the main contractor, to work at the times and in the places which the main contractor orders, and to comply in all conditions on the contract with the instructions of the main contractor. When we get those two documents signed by the sub-contractor we ought to eliminate all those unread conditions which are normally printed on the back of the forms of tender of sub-contractors, and we should then finally have a precise contractual relationship established when we have ultimately signed the main contract.

Sub-Contractors' Guarantees

But we have another aspect of sub-contracting which, in my legal discussions in committee in the last eighteen months, I have found to be appallingly worse than I ever imagined it to be, that is, the position of guarantees of various kinds which sub-contractors present to us in giving their tenders. We usually have a guarantee of performance in the case of heating and ventilating plant; we frequently have a guarantee of performance in the case of lighting installations and we sometimes have a guarantee of carrying capacity in the case of specialist steelwork or reinforced concrete. Those guarantees are normally given to the architect either endorsed on the tender or in the form of a letter, but when they are embodied in an unknown sub-contract with a builder they are lost, and, although in effect the fault

of the steel or the fault of the heating may be due to the combined action of the main contractor and the sub-contractor, it will be found in the great majority of cases that the main contractor has given no guarantee whatever and the sub-contractor has given a guarantee to the architect in his tender which is entirely omitted when he signs his sub-contract with the main contractor. Any rectification that is possible when the thing goes wrong is more due to the goodwill of both parties and their standing in general than it is to any legal obligation. That is an entirely unsatisfactory arrangement, because patently the client thinks that these guarantees exist. Therefore I think that we need to incorporate the guarantee in the conditions of the sub-contractor's tender, we need to incorporate it again in the conditions of the sub-contract, and we need a clause in the main contract which places a legal obligation upon the builder to carry those guarantees through to the client and to carry the guarantee of the sub-contractors.

Fixed Form of Sub-Contract

I think it becomes obvious that, if we are really going to tie up our contracts in this respect properly, we must have a form of sub-contract which we all accept, which is accepted by the sub-contractors' association, which is accepted by the builders' association, which is issued to tender to the sub-contractors, which the builder is instructed to incorporate in his main contract, and which therefore becomes an essential part of the contract documents with which we are all familiar.

We must also realise another aspect of sub-contracting. If the builder is really legally carrying these obligations, many of them of very substantial magnitude, it is only right and proper that he should know beforehand the names of the persons with whom he is being asked to associate himself as a contractor. There seems to be a strange reluctance on the part of certain public authorities and upon the part of certain private architects to disclose the names of the sub-contractors in the bills of quantities, specifications, or any other documents. In certain cases they are known: in other cases they are unknown. If they are known before the main contract is signed or, still better, if they are known before the bill of quantities is issued, it seems to me to be an obligation on the part of the architect to put the names of the sub-contractors in the bill of quantities and in the specification, and let the builder know the kind of people that he is being asked to carry as part of his contract. If for any reason they are not put in contract documents, I think the builder should have the right to refuse to accept them at a later date if he is also to be asked to carry any responsibility as the result of accepting them. The lack of a clear-cut arrangement by which the individuals and the responsibilities are fully known to all parties is one of the great faults of our contract making at the present time. I think our system needs overhauling. I think it needs the issue of official forms of invitation to sub-contractors to tender; by "official" I mean agreed forms of invitation between the interested parties, the architects, the quantity surveyors, the master builders and the main sub-contractors. I think it needs an agreed form of sub-contract, and I think it needs some revision of the main form of contract, whereby the disclosure of names is a necessity, and whereby clear-cut contractual obligations, including obligations to guarantee, are fully obvious and fully covered. I also think that, before those names are inserted in the form of contract, the sub-contractors should be required to tender for their portion of the work.

Sub-Contractors' Tenders

With regard to tender, it is obvious that a man cannot tender unless he has some conditions upon which to tender, and merely to say "Heat No. 1 building" does not enable anybody to tender with any sort of equity or satisfaction.

We are all aware of the fact that the builder can give us a very different class of building for what is to all intents and purposes the same specification. We have in the past relied to a far greater extent than the majority of us realise upon the sense of responsibility of the building industry as a whole, and in particular upon the very high sense of responsibility of a great many master builders throughout the country. They will not let a building go up with their name attached to it which is not capable of standing the test of time. The war has removed firms, removed men and disintegrated the relationship between craftsmen and employers, and we are going to face a world in which this disintegration is extremely widespread and may well destroy a great part of the goodwill which has been built up over so many years. It may be possible in years to come to get it back again, but in the interim period we must rely a great deal more upon the precise statements which we put into our bills of quantities and into our specifications.

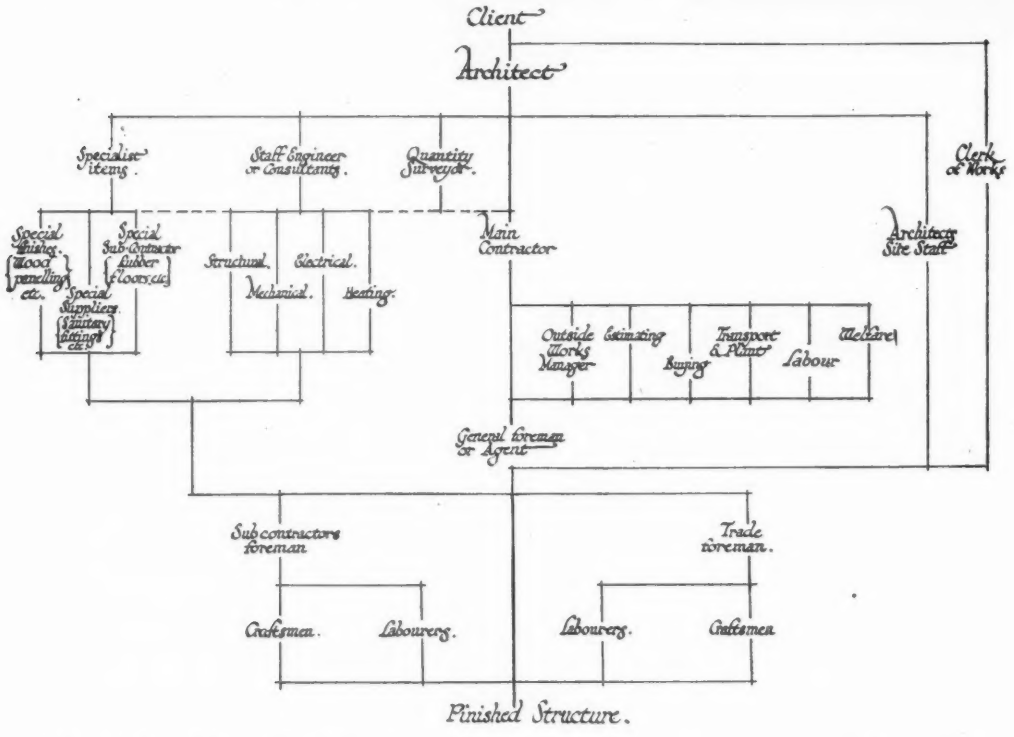
Therefore, if we are to receive a good tender for heating, we must say what heating we want, and we can say what heating we want only by describing it in technical terms, both upon drawings and in specifications, and, if necessary, in bills of quantities. We can so describe it only if we have the necessary technical equipment, and we can secure that equipment only by employing a consulting engineer with the necessary knowledge, a member of our staff with the necessary knowledge, or something that is parallel, a department, in the case of the public office.

The farthest away that we ought to get from the complete specification and drawings is a precise technical description of the work we expect to get, the temperature, the cubic capacity of the building, the number of radiators and the sort of position into which we want them to be put, the type of boiler we should like, the method of fuel handling and various other technical points of that kind, which presuppose a considerable measure of knowledge and also presuppose quite a large amount of work, because anything short of that means that we are receiving tenders under false conditions. One man may calculate the cubic capacity of a building to be a certain figure and another man may make a mistake and take it to be only one-third of that area, and he puts in his tender and gets the job on the lump-sum price. We may congratulate ourselves on the low tender, but we know perfectly well that at some stage extras will arise which will make up for the mistake which the tenderer made when he put in his price. If a mistake in calculating the cube is made in the architect's office, the contractor is entitled to be paid for whatever error was made, but at least the tenders are on the same basis.

I have considered, therefore, that a very large amount of this detailed work is going to be thrown upon our shoulders, and we have to organise our offices to be able to take that burden. We have to look at our fees to see whether they enable us properly to pay for these services, and we shall have to face the fact that if we do not carry out that work somebody else will. You may say: "Who is the somebody else?" I want to digress now upon what you may criticise as very dangerous ground, and I do so only because I think it is highly important.

The Engineer Organiser

On the diagram at the head of the next page I put the client at the top and the architect below him and the various consultants on one side, acting under the architect. But suppose we are dealing with a housing scheme which embraces houses of the Dudley agricultural type, or the Dudley urban type, accepted published types of house, and the scheme is to consist of a large number of houses—600 houses—and the main operations to be carried out being the supervision, planning and design of the roads, the footpaths, the sewers, the water mains, the gas mains, the electric cables and the general earthworks which go with a difficult hilly site. It becomes obvious at once that the architect, if he is concerned only with design, can do no more than draw a plan of roads which takes account of contours, provides satisfactory vistas and, generally speaking, makes the roads a part of the countryside. In regard to the houses, he can do no more than choose the bricks and the colours of the paints and possibly the tiles on the roofs. Both the bricks and the tiles may be local products, so that even that choice may be out of his hands. He may be able to choose the colours of the decorations inside the houses. Beyond that he cannot



exercise any architectural qualities worth talking about. You may say that to plan the estate and choose the materials is really the whole story—that is what the public are going to look at as its local piece of architecture when the job is complete, but I should like, dangerously perhaps, to ask you to look at the picture the other way round for a moment.

Supposing we put a highways engineer, a civil engineer, where I have put the architect, and we put the architect where I have put one of the consulting engineers, and supposing the civil engineer says to the architect: "Now prepare me a layout of this estate and make sure that the bricks are properly chosen and that the colours are such my community will be perfectly contented with the appearance of the houses," there is no reason that I can see why those 600 houses might not be built under that organisation as efficiently and possibly in some way as effective architecturally as if the architect were in complete control. I have seen organisations where within that limited sphere the architect was given complete control of that measure of the work so that the layout was his, providing it was done economically, and the colours were his and the choice of materials and finish were his.

In principle I think that would be a disaster to the country, but, unless we are able so to organise the building work that there is no difficulty on the organisational side, I am not at all sure that the tendency at the moment is not to move in the direction of the control of works by the engineer, just because he may be a more efficient organiser than the architect.

There are other buildings where other conditions apply and the interchange is not so obvious, but I am most anxious that all of us should see to-day that there is an alternative if we fail to reach the high standard we should set ourselves in the post-war world.

The Architect's Office

I have given you a brief picture of the make-up of the organisation. Now let us turn for a moment to the architect's office. The architect in carrying out his own work is going to be faced, like everybody else, with 100 per cent. employment. As yet we have only vaguely realised what 100 per cent. employment means. In the first place, it means inevitably less men than we should like to have. In the second place, it means that the staff is more expensive than we like to contemplate. In the third place, it means that we have of necessity to make our work more efficient, that is, do it with less staff and greater intelligence. But there is another factor. As soon as we get 100 per cent. employment we find that we are employing all the over-age people, all the under-age people, all the people with partial disabilities and all the unintelligent people. That is not a fancy picture. We have seen it actually in operation in the industry in the last twelve months of war.

As soon as we attempt to employ the inefficient efficiently we must provide them with mechanical aids. We must use our intelligent people to lay down the basis of working, so that we simplify, as far as possible, the work which the remainder have to do. It is not true to say that the unintelligent dislike this method of working. Quite the contrary is the case. I walked into the ordering section which I had to control as Director of Works, specially to examine the attitude of typists towards the very dull operation of typing out orders, day after day, for things which had no interest to them and which very rarely changed. There was a great deal of trouble if those orders were incorrectly typed, yet of necessity the job had to be dull and monotonous, and I feared that the staff would find it dull and monotonous and would therefore do the work inefficiently. In the first place the orders had to be written by hand, and to begin with they were written as if on a quarto sheet, with each item under the next, properly separated, so that there were the name of the contractor, the name of the job to which the temporary huts were consigned, the description of the parts of the huts and the number and the expected date of despatch, and a few other details. It was found that the girls made a good many mistakes on those typings, so a new form was evolved, whereby a sheet of paper

1. CLIENTS INSTRUCTIONS.		JOB NAME.	
2. SITE INSPECTION & REPORT.		JOB No.	
3. SURVEY. BOUNDS & SPOT LEVELS.		LICENCE No	
4. SKETCH PLANS SUBMITTED.		PRIORITIES	
5. C.S. APPOINTED.		CLIENT.	
6. APPROX. ESTIMATE SUBMITTED.		CONTRACTORS.	
7. SKETCH PLANS APPROVED.		CONTRACT AMOUNT.	
		CLERK OF WORKS.	
		ASSISTANT IN CHARGE.	

	Commenced	Finished.		
8. Site Survey			21. Appln. for licence.	
9. Prelim L.C.C./L.A.A.			22. Wkg. dwgs. commenced.	
10. T.P. application.			23. Wkg. dwgs & spec. to Q.S.	
11. R.D. application.			24. B. of Q. to tender.	
12. B.A. application.			25. Tenders received.	
13. Means of escape.			26. Clients app. tenders.	
14. Drains			27. Contract let.	
15. Party walls.			28. Contract commence date.	
16. Rights of Light.			29. Contract signed.	
17. Elec. Supply reqd.			30. Contract completion date.	
18. Water "			31. Actual completion date.	
19. Gas "			32. Maintenance period ends.	
20. G.P.O. Tel. "			33. Maint. inspection made.	
			34. Maintenance cleared.	
			35. Final a/c. cleared.	
			36. Habitation Cert. obt.	
			37. M. o. Esc. appr. obtained.	

CERTIFICATES ISSUED.		
No.	Date	Total to date.
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
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12.		
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27.		
28.		
29.		
30.		

FEES APPROX.

Date.	Paid.

CONSULTANTS.

Name.

Approx. Fee.	
Date.	Paid.

Name.

Approx. fee.	
Date.	Paid.

Name.

Approx. Fee.	
Date.	Paid.

Name.

Approx. Fee.	
Date.	Paid.

PROGRESS.	
Date.	%
	100.
	95.
	90.
	85.
	80.
	75.
	70.
	65.
	60.
	55.
	50.
	45.
	40.
	35.
	30.
	25.
	20.
	15.
	10.
	5.
	0.

Above—A form listing the operations of a normal job (see text below). *To right*—The back of the job form; certificates record.

had a rectangle on it, corresponding to the form of the final typed order, for the various pieces of information. Thus on the final typed order there would be the name of the contractor and his address at the top, and on the handwritten form there was a rectangle in which were written the name of the contractor and his address, so that the typists' job was reduced to the most mechanical operation possible. They had every piece of information put in the rectangle as nearly as possible corresponding with the final form which they had to fill up. Curiously enough, all the girls to whom I spoke thoroughly enjoyed that operation. I saw no signs of fatigue. I said: "Do you like it?" and they said: "Yes." I said: "Do not you find it monotonous?" and they said: "No, not at all." I said: "What do you do? You do not think about it?" and they said: "No, we do not think about it. There is no need to. We think about what we did last night and what we are going to do to-night and the boy friends we are going to meet." That was not just casual comment; it was unquestionably true.

Therefore we come to the fact that, while there are many of us who are impatient at jobs with no thought in them and no constructive design in them, there are very many people whose object is to go through their working day as comfortably as possible, and, provided that can be arranged for them, they reach their measure as human beings, as far as anybody can discover. Therefore I feel that, if we are going to have 100 per cent. employment, we shall have a number of that sort of people to employ, and we shall need to get mechanical aids which save the labour of the intelligent and well developed as much as possible.

Architect's "List of Items"

This is a form on which are set out the operations of a normal building job. If we have them on a list in this way we make sure that we get them all done. If we look at the list once a week and find there are any blanks we can take steps to have the operations in question carried out. If there are any operations here that do not apply to the particular job, we cross them out. In this way we do not run nearly so much risk of either ourselves or our staffs forgetting anything, such as forgetting to obtain a town-planning approval until the building is half up, when we may be told that it projects halfway across an arterial road, or something of that kind, and we may have great difficulty in explaining the matter to our clients, and local authorities are very disinclined to move an arterial road. I think this is a very useful form.

Certificates and Fees

Then we have to deal with the issue of certificates and various other things, so on the back of that form we put the rest of the information for running the contract. This will remind us of the fees we hope to get and of the fees we have to pay and it enables us to check off the percentage of the contract which is carried out.

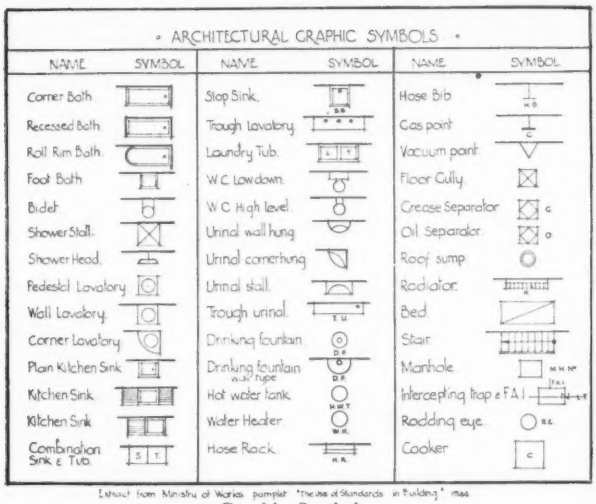
These sorts of aids are very little trouble once we have got a few hundred of them or a few dozen of them cyclostyled and actually in operation, and they do help very greatly in maintaining efficiency in an office.

We shall have a great many land survey jobs to do on housing schemes, and there again I have found that, in asking for reports from distant people on sites they have visited, it is essential to put on a piece of paper the headings of the information that is required.

Site Information

If we do not use a form of this kind, it frequently happens that not one but several visits are needed, often to country districts which are difficult of access, in order to get some vital piece of information.

You will realise, incidentally, that if all this kind of information is secured before any scale plans are started the chance of the original estimate, with which we started this discussion, being reasonably accurate is very greatly enhanced. Without such



ARCHITECTURAL GRAPHIC SYMBOLS

NAME	SYMBOL	NAME	SYMBOL	NAME	SYMBOL
Corner Bath		Slop Sink		Hose Bib	
Recessed Bath		Trough Lavatory		Gas point	
Roll Rim Bath		Laundry Tub		Vacuum point	
Foot Bath		W.C. Low down		Floor Gully	
Bidet		W.C. High level		Grease Separator	
Shower Stall		Urinal wall hung		Oil Separator	
Shower Head		Urinal corner hung		Roof sump	
Pedestal Lavatory		Urinal stall		Radiator	
Wall Lavatory		Trough urinal		Bed	
Corner Lavatory		Drinking fountain		Stair	
Plain Kitchen Sink		Drinking fountain on pipe		Manhole	
Kitchen Sink		Hot water tank		Intercepting trap & F.A.I.	
Kitchen Sink		Water Heater		Rodding eye	
Combination Sink & Tub		Hose Rack		Cooker	

Extract from Ministry of Works pamphlet "The Use of Standards in Building" 1944

Graphic Symbols.

information there is a very serious risk that some vital expenditure will be overlooked and perhaps the site will have been taken and it will be too late to rectify the matter.

In preparing our drawings I think we should use an accepted set of symbols, so that whenever builders receive our drawings they know that any particular sign always means the same thing.

List of Symbols

I think this has been published by the British Standards Institution, but, if it has not, I hope it will be. If we all follow it, we shall establish a standard for conveying information which

Date :			Drawing No. :
Drawn by :			Scale :

STATE ANY VARIATIONS FROM CONTRACT DRAWINGS AND SPECIFICATION AS FOLLOWS: IF NO VARIATIONS STATE NONE.

NATURE OF VARIATION	DATE	COVERING V.O

TO WHOM SENT	DATE	REMARKS

• QUESTIONNAIRE FOR PRELIMINARY SURVEY •

SITE AT ..... JOB No ..... MAP No 1" ..... C.

A Site.	1 Nature of subsoil from observation &/or consultation with local authority		15 Disposal to soak-away
	2 Configuration of ground, i.e. flat, sloping, undulating, etc.		16 Disposal to surface-water sewer in road.
	3 Is site covered with trees?	F. Electricity Supply	17 From local supply or rural overhead mains.
	4 Portions of site unsuitable for building because of water-logged or other conditions.		18 Type of supply — direct or alternating, etc.
B Roads	5 Type and width of existing road approaches.		19 Voltage, frequency, phase.
	6 Any widening essential to facilitate access to site.		20 If no supply in vicinity of site how far to nearest supply point?
C Sewage	7 Nearest available sewer.		21 Contact Supply Authority for district.
	8 Obtain depth of nearest invert from Local Authority		22 Name & address of Local Supply Authority, representative and Telephone number
	9 If no sewer recommend alternative means of disposal.	G Gas Supply	23 State if road mains available.
D Water Supply	10 From main road, is pressure adequate to supply 25 galls per person per day?		24 Name and Address of Local Supply Company representative and Telephone number.
	11 If no main supply what other means, i.e. wells, or other supply and if treated?	H Transport	25 Available for materials, distance of nearest railway goods siding.
	12 What temporary water supply can be utilised for building operations?	J Local Authority	26 Consult Local Authority to ascertain any special disability on site.
	13 Name & address of local supply company, representative & telephone number		27 Give name & address of Local Authority, name of Surveyor or Engineer & phone numbers.
E Surface Water	14 Disposal to ditches?	K	28 Any other observations.

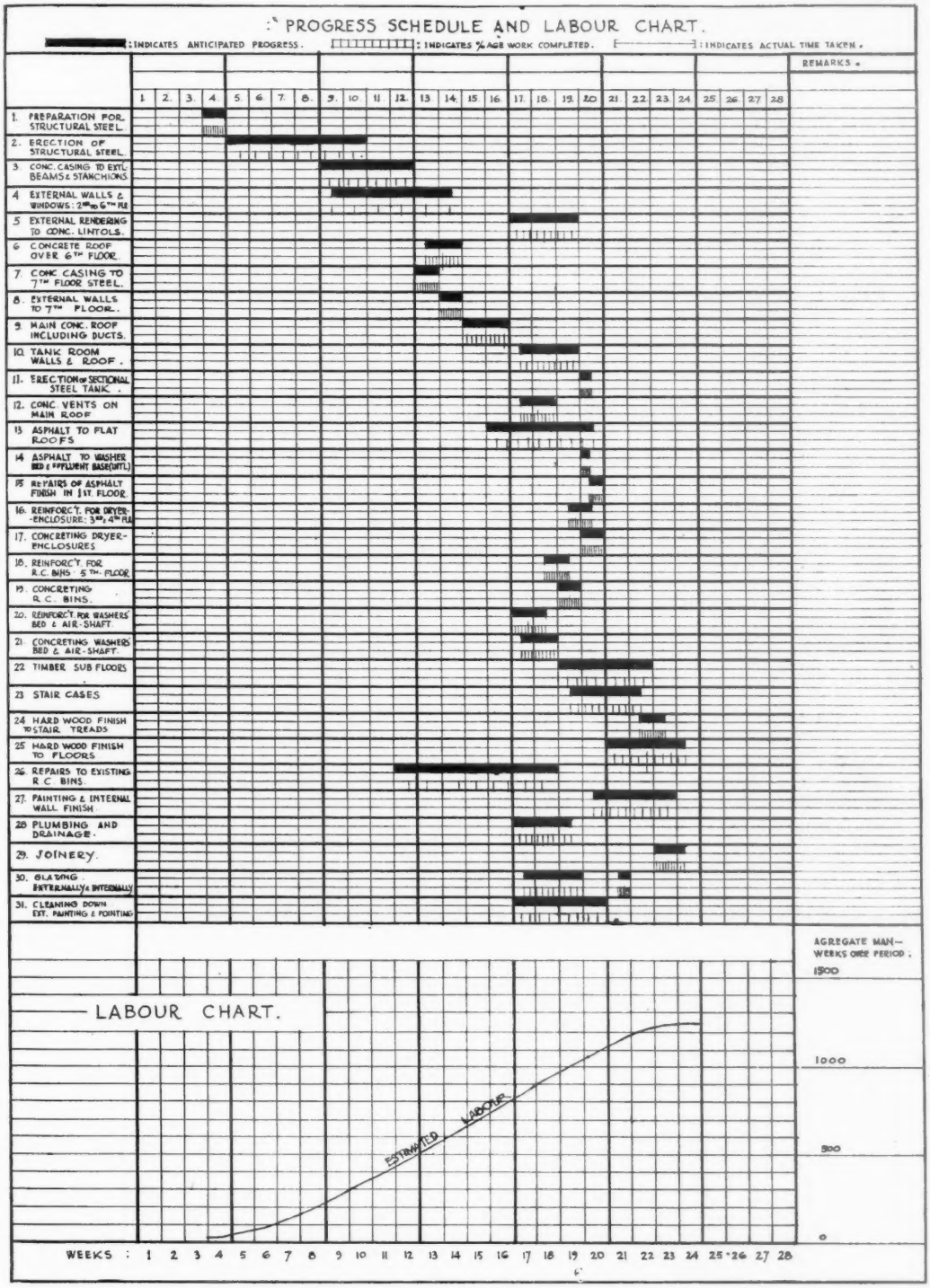
ought to help very greatly in letting contractors know what our drawings mean when they get them, with the minimum of effort on the part of their staffs.

Drawing Office Register

Then we come to the issue of drawings in our own offices, and this (*figure, top right*) is the drawing register sheet I use because even in the issue of drawings I have found it surprisingly easy to go wrong. Drawings, even in the best offices, must be subject to adjustment and alteration, and, if they are not duly recorded and given a fresh number or letter, the record of the issuing of copies is always likely to be wrong. Somebody gets hold of a print and runs it off at the wrong stage, or we may have a case such as the following: we try to assess the value of an extra, and the builder claims that he did the work according to the first drawing and subsequently it was altered, and an argument ensues as to whether the drawing was as the builder says it was at all, and we bring out our drawing and show him that for many months, as far as we know, that has been the position of the drawing, whereas a drawing register would show that the week after the contract was signed we altered something; it was only trivial and was not worth the issue of another drawing, but it was substantial from the builder's point of view. I have found that there is more in the issue of a

To left—Site survey questionnaire.

Top right—Drawings register.


PROGRESS SCHEDULE AND LABOUR CHART.
: INDICATES ANTICIPATED PROGRESS.
: INDICATES % AGE WORK COMPLETED.
: INDICATES ACTUAL TIME TAKEN.
REMARKS.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
1. PREPARATION FOR STRUCTURAL STEEL.
2. ERECTION OF STRUCTURAL STEEL.
3. CONC. CASING TO EXTL. BEAMS & STANCHIONS.
4 EXTERNAL WALLS & WINDOWS: 2ND TO 6TH FLR.
5 EXTERNAL RENDERING TO CONC. LINTOLS.
6 CONCRETE ROOF OVER 6TH FLOOR.
7. CONC CASING TO 7TH FLOOR STEEL.
8. EXTERNAL WALLS TO 7TH FLOOR.
9. MAIN CONC. ROOF INCLUDING DUCTS.
10. TANK ROOM WALLS & ROOF.
11. ERECTION OF SECTIONAL STEEL TANK.
12. CONC. VENTS ON MAIN ROOF
13 ASPHALT TO FLAT ROOFS
14 ASPHALT TO WASHER BED & EFFLUENT BASE(INTL)
15 REPAIRS OF ASPHALT FINISH IN 1ST. FLOOR
16. REINFORC'T. FOR DRYER-ENCLOSURE: 3RD, 4TH FLR
17. CONCRETING DRYER-ENCLOSURES
18. REINFORC'T. FOR R.C. BINS 5TH. FLOOR
19. CONCRETING R.C. BINS.
20. REINFORC'T. FOR WASHERS BED & AIR-SHAFT
21. CONCRETING WASHERS BED & AIR-SHAFT.
22 TIMBER SUB FLOORS
23 STAIR CASES
24 HARD WOOD FINISH TO STAIR TREADS
25 HARD WOOD FINISH TO FLOORS
26. REPAIRS TO EXISTING R.C. BINS.
27. PAINTING & INTERNAL WALL FINISH
28 PLUMBING AND DRAINAGE.
29. JOINERY.
30. GLAZING EXTERNALLY & INTERNALLY
31. CLEANING DOWN EXT. PAINTING & POINTING
LABOUR CHART.
AGREGATE MAN-WEEKS ONE PERIOD.
1500
1000
500
0
ESTIMATED
WEEKS : 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Progress schedule and labour chart (see text on page 72).

drawing and the keeping of a drawing register than in my early ignorance I thought possible.

Time and Progress Schedule

Now we come to the time and progress schedule for the operation of a job. The schedule shown (page 71) is a very simple form of progress schedule, suitable for a great many forms of contract. At the bottom is a labour chart. I am quite sure that we shall hear a great deal more about labour charts in the future than we ever did in pre-war days. In a period of 100 per cent. employment it is obvious that some system of issuing labour will be a necessity. The present system is that every Government Department is given a certain proportion of the total labour force, not in bodies but in bulk allocation, and when approval is given for a building the estimate must show the number of man-weeks or man-months needed for the erection of the building. That labour force is given out of the general pool, and it is given in bodies in due course from the labour exchange. If we take the basis of calculation as, say, £50 to £60 per man-month we can calculate the number of man-months that will be needed to complete the building, and, if it is decided that the building is required in six months, we can find the number of men needed as an average throughout the period. With a little experience and intelligence, we can show the builder the tail off of the labour and therefore arrive at the labour force required in each week and in each month, and that can be issued to the builder with the contract. I am inclined to think that, either with the conditions of tender or before the acceptance of the contract, the provisional progress sheet should be made up and the builder should be asked to send back his correction on this time and progress chart, so that we can get rid of these complaints of the client that we told him he would get his building in six months and in fact he has not got it after the expiry of twelve months. We can do that only as the result of a joint and knowledgeable effort between the architect and the builder.

Moreover, we have all seen the kind of tender which says that time is the essence of the contract and the contract time given by the builder will be an element in the acceptance of his tender. Without a time and progress schedule, even I could put down six months if I thought that would get me the contract, and I could rely upon quite a lot of ingenious things at a later date to explain why it took me nine months, but, if I am told to send in, before my contract is signed, some indication of the number of men I expect to get and the way in which I expect my processes to follow each other and the positions in which my sub-contracts are fitting that programme, then I have some substance in saying that the building can be built in six months or nine months or any other period.

Again, let us take one of the basic causes of criticisms of architects, namely the unsound time estimate of which the public complain. As in the case of many other things, there is no royal road to an accurate time estimate. In the old days we hardly realised the extent to which we relied upon the existence of 200,000 unemployed and a vastly overstocked materials market to make up for the errors of judgment of ourselves, our clients and our builders. In those days if we were short of time the builder telephoned to the labour exchange and said : " Send me twenty bricklayers by Monday morning," and, when he got them, if he found he had overestimated his requirements he discharged two on Tuesday and two more on Wednesday, and when the architect was not looking he sent away most of the others. But he was able to get the labour on demand. In 100 per cent. employment conditions that labour will not be there, and if the architect or the builder is not able to make a sensible demand ahead for the allocation of the labour it will not be able to be fitted into the programme at all. Therefore we shall be forced by circumstances to learn this process of forecasting time in connection with labour and materials, and we shall have to endeavour to keep within that forecast ; otherwise we shall have no labour or we shall have chaotic conditions of fighting with each other for labour and therefore render all the contracts disastrous in their slow progress. A mastery of the programme and an ability to deal with the progress of the work on that programme is going to be another of the things which circumstances will compel us to make part of our day-to-day organisation.

Here is a similar progress chart, without the labour graph, marked in terms of the programme in heavy black marking, and in progress in bulk in hatched marking and in time in a straight line. The Ministry of Works provide this time and progress schedule. They published a similar one, but with slightly different marking, in their pamphlet relating to programme and progress schedules. It is only one of many types which can be evolved to suit all sorts of building.

The great point I want to make here is that, whereas in pre-war days a mastery of time and progress schedules was one of those things which the more efficient might like to acquire and the less efficient could do without, in the post-war days it will be a necessity for everybody to have such schedules in order to be able to work at all.

Sub-Contractors in Progress Schedules

You will also realise that, if we have accepted the nominated sub-contractor for many things as a necessity, it is a remarkable fact that neither the builders nor the architects as a whole have felt the urgent necessity of fitting those sub-contractors (often very numerous) into a specific place in the building schedule and demanding that they should stay there and that, whatever happened, they had to do their small part of the work so that it became part of this machine.

Clerks of Works

There is one unit of the organisation that I think deserves special mention, that is the clerk of works. The clerk of works occupies a very peculiar position in the building industry, perhaps more peculiar than some of us realise. I had rather loosely thought that the clerk of works was acting under my instructions and that if he made a mistake I was probably liable, but that is not the case legally. The clerk of works is normally recommended by the architect and paid by the client. None of us ever objected to him being paid by the client, but there is a legal significance which is extremely important, because, as the client pays the clerk of works, the clerk of works is the client's servant, and if a mistake is made on the building in the day-to-day operation that is a mistake made by a servant of the client and not by a servant of the architect. If the mistakes are so numerous that they become part of the contract operations or so big that they obviously are outside the scope of a day-to-day watch-dog like the clerk of works, then they come within the scope of the architect and the architect becomes liable, but there is quite an appreciable field of mistakes for which the architect avoids liability because the clerk of works is not his employee.

I am not at all sure that that is a sound position. I believe that if the clerk of works was made the employee of the architect his wages could still be charged to the client through the architect's account, and it would bring home to all of us a greater degree of responsibility for what is happening on the contract. We should be very much more inclined to see that we got an efficient clerk of works, that he was properly supervised and that he carried out his job as he should do.

Again, the clerk of works is one of those ancient institutions of building which have remained for a very long period. The best clerks of works are magnificent craftsmen, but, as has been proved in recent years, they are poor organisers, and, as contracts have increased in complication, there has been a tendency more and more to regard the clerk of works as someone who should look after the co-ordination of the sub-contractors, which in very many cases they have not been capable of doing successfully.

Therefore I am sure that the site supervision of building has again to undergo a review of a very substantial character. We have to consider whether the calibre of the average clerk of works is good enough for him to take charge of the building, whether he is able to give the builder sufficient support, and whether he ought not to be employed by the architect, so that the architect

has a direct interest in the day-to-day operation by being made responsible for it, and finally whether in larger contracts the architect is not bound to-day to have a man of a very much better calibre, as well as the clerk of works, to look after the bigger questions of organisation and site supervision. I think that that man should be a site architect, and, in case there is any misunderstanding, I would add that that site architect will never take the place of the good clerk of works. I have employed architects or engineers and clerks of works jointly on a large number of buildings during the war, and I have found that, strangely enough, neither trespasses on the province of the other. A good site architect or engineer will walk round a site and by exercising care will see whether brickwork is being well done or not, but he will in all probability pass without noticing quite a lot of bad brickwork, because the recognition of bad brickwork is not instinctive with him, whereas a good clerk of works walking over a large site on which a lot of brickwork is going on does not need to think : " Is this brickwork good or is it bad ? Could it be better ? " His instinct as a craftsman tells him at once. The same thing applies in the case of foundations, the mix of concrete, the mix of mortar, the attack of frost upon pointing, and all other such practical matters. I do not believe that any office-trained man, whether he be engineer or architect, will ever acquire that sense of craftsmanship which comes only with the daily use of tools and which the good clerk of works possesses.

I think we have to face the fact that, at least in our larger contracts, a more experienced and wider kind of supervision is necessary, and I believe the profession would gain if the clerk of works was put under its control instead of being under the control of the client.

Cost Control

Finally, cost control has to extend over the control of the work in progress. The work in progress must at times be subject to change ; it must at times experience unforeseeable conditions, and that means that something must be altered. Those alterations, great or small, should be covered with a standard variation order. I should like to see the R.I.B.A. issue a standard variation order, so that the whole profession used the same kind of variation order throughout the country and the builder became familiar with precisely the kind of thing he was being asked to do. It should have proper paragraphs for the estimate of costs and any other variations which might take place. I should like it to be made a condition of all contracts that if the builder did not claim the extra on work within a month of being ordered to do it he would have no claim at the end of the story. I have found the greatest difficulty in getting builders to give me all their claims for extras in the current month ; first, because it is difficult and they have to keep a close watch on the building, and, secondly, because they really want to see how much the contract has cost them at the end before they are committed to the final account. In other words, we have arrived at a slipshod method of running contracts by which the keen competitive tender has become too keen and the contract conditions are too loose. The builder relies upon making up his losses by claiming extras, but he should have to declare the whole of his claims for extra cost month by month and be precluded from claiming any more at the end of the contract. Until we tighten up our contracts on the month-to-month running we cannot hope to control the cost of running contracts, still less can we hope to eliminate the bad tender, the tender from the man who puts in a low price to get the contract. If as a profession we run our contracts so tightly that it is not once in a hundred times that there are loopholes for the builder to claim an extra, I am sure the benefit gained will be immense.

I should like to say that in considering the substance of what I have said this evening I am indebted to a group of architects whom I asked to assist me, namely Mr. Howitt, Mr. Tait, Mr. Macdonald, Mr. Bunch, Mr. Sullman and Mr. Michael Waterhouse. Their advice was of very great value.

Extracts from the Discussion

Mr. J. G. Gray (President of the National Federation of Building Trades Employers), in proposing the vote of thanks, said : In the past we in the building industry have not always been able to get a picture of what the architectural profession requires from us in such clear and concise language as that in which it has been given to us to-day. I am sure that we owe a great debt of gratitude to Mr. Bennett for the way in which he has portrayed the difficulties and the conditions that we shall have to meet in the coming post-war years.

Mr. Bennett has suggested that the architect is the true key to the problem of getting improved building and also speedier building in the future. He has mentioned the different types of contracts that we must have to suit the changing conditions. I think we must pay heed to many of the proposals that he has made, and I am sure that if the charts which he has shown us are used the result will be to enhance greatly the status of the building industry to meet present and future needs, particularly in view of the difficulties of labour. The labour difficulties of the years to come will be extremely great. The type of workman that we have now is not so skilled as formerly, because of the ravages of the war, and we have not the numbers that we need to complete our work.

Mr. Michael Waterhouse (Honorary Secretary) : I was particularly pleased by Mr. Bennett's reference to the education of the client. That subject is very well dealt with in the manual on the placing and management of contracts, in which there appears a very useful set of paragraphs to put before a client. To my mind, the duty of the architect is to translate the wishes of the client into the language of building, which the client himself cannot speak; but the client has to be educated to express his wishes even in his own language, and I should like to see in the architectural student's curriculum a course of lectures on client management, both individual client management and committee management.

Sir George Burt : I think it is a pity that one suggestion which Mr. Bennett made is not more generally adopted in the building industry as opposed to the civil engineering industry. He referred to the duties of clerks of works and site architects, and I think those of us on big jobs who have had the fortunate experience of having a site architect or, say, an assistant from the architect's office always on the site will wholeheartedly support what Mr. Bennett said as to the advantage of that procedure. It is of benefit also to the site architect himself, who is usually a junior, because it provides him with experience which he can obtain in no other way and which will, I am quite sure, be of real value to him and to his clients in his future career.

Mr. P. V. Burnett [*F.*] : There are two practical points which I should like to raise. The first has reference to Mr. Bennett's suggestion that the sub-contractor should be decided upon before the bills of quantities go out to tender and that his name should be inserted in the bills of quantities. I should like to ask Mr. Bennett whether he does not think that that would delay the sending out of the bills of quantities to tender, so that actually the whole job would take longer than it would if the normal practice of inviting sub-contractors' tenders after the contract is placed were followed. We must recognise that many of these sub-contractors are not wanted until the later stages of the building, and it seems to me that a very substantial saving of time, which will be of vital importance after the war, will be gained by the adoption of the usual practice.

That brings me to my second point. Mr. Bennett has quite rightly said that the public have a very poor opinion of us because our estimates of time are very often wrong. From the public point of view, the time taken to erect a building is not the time taken on the job but the time which elapses between the building owner giving his instructions and getting his finished building, and only part of that is time taken on the job ; the rest is time occupied in preparatory work. If the building is one of a considerable size and is in a city such as London, there is a period of at least six months during the preparatory stages when the whole scheme is utterly out of the control of the building owner or the architect, and that period may be longer after the war than it has been in the past. For instance, town planning is more uncertain to-day than it has ever been in its time element. We are told that such things as building licences will have to be obtained, and no one knows how long that will take. In many cases the War Damage Commission will be concerned, and in that connection an altogether unknown element of time will be introduced again.

I should like to ask Mr. Bennett whether he can offer any suggestions as to how an architect, in those circumstances, can estimate the time that will be taken to complete a building, from the date when the client gives his instructions to the date when the client can occupy the building. That is the time which the client really wants to know.

Mr. A. Steele [*A.*] : I am an architect and an employee of a local

authority. Mr. Bennett struck at one of the real troubles of the profession when he spoke of the possibility of the engineer dominating the building industry in future. This is not the fault of the architect nor is it the fault of the engineer. The Institute has a very important duty to perform towards the architectural students of the future in including training in client management.

I feel that, in addition, we have to educate the public at large and try to bring before them the need for the statutory appointment of an architect as distinct from his appointment at the goodwill of the local council.

Mr. W. F. B. Lovett [*F.*] : Suppose we send out an invitation to tender to five firms, make preparations to proposing to bind the successful contractor to a labour schedule. I presume that before they send in their tenders they will have to make provisional arrangements with the Ministry of Labour. Only one of the tenders can be accepted, and the firms whose tenders are not accepted will have to inform the Ministry of Labour that they have not been successful. The repercussions of that in principle apply no less to the sub-contractor than to the contractor. Looking at it from the contractor's point of view, he submits tenders all over the place, knowing that in an open market he can get only a certain reasonable amount of the work and that in some cases he may not want the work at all, even though there is some arrangement on a reasonable basis as to the amount of work he can have. I can foresee difficulties that may make the procedure work less smoothly than Mr. Bennett suggested, and I hope, having complete confidence in Mr. Bennett's view of the situation and knowing that he must have given a great deal of thought to this aspect of the matter, that he will expand on it a little in his reply to the discussion.

Mr. Michael Waterhouse : I should be very glad if Mr. Bennett could give the R.I.B.A., not now but afterwards, his suggestions for a standard variation form, which could be considered by the appropriate Committee. I had a variation form in my own practice, with different coloured copies for clerks of works, contractors, and so on, and eventually I gave it up because it was too complicated. Also, if Mr. Bennett has any suggestions for a co-ordinated sub-contractors' form I am sure we should like to consider those as well.

Mr. H. C. Harland : Mr. Bennett has shown us some very interesting charts. Some of the items set out on those charts in the proper order are actually carried out in the wrong order as far as we builders are concerned. I would particularly stress the issue of plans and details. Mr. Bennett has put that down in its proper order, but how often we find that when the work is getting well on its way we are constantly having to ask for details.

I take it that Mr. Bennett visualises the elimination of the nominated sub-contractor eventually, because in effect he says that the employment of a nominated sub-contractor is an expensive method of getting the work done, and very often the client is not aware of the fact that he is paying a fee for consulting and for the provision of a scheme and very often he pays through the nose for the work which is entailed afterwards. I feel sure that Mr. Bennett visualises the elimination of that by the employment of consultants in various classes—heating, electricity, and so on—so that the various consultants can hand to the quantity surveyor sufficient data to enable him to take off the bill of quantities for this specialised work, and then it will be for the general contractor to price up the whole thing or get the prices. I feel sure that if that is done it will result in economy for the whole industry and greater efficiency in every way.

Mr. A. E. Bullock [*F.*] : I doubt whether every architect could have the staff to deal with all these forms and conditions, excellent as they are in the case of small contracts of, say, £5,000 to £10,000. For contracts above that, the amount of administration that is required might be provided.

Mr. Alister Macdonald [*F.*] : Mr. Bennett can no doubt very easily dispel the impression that may be formed in some people's minds that what he has said this evening applies only to those architects who have large practices.

The President, in thanking Mr. Bennett and drawing the discussion to a close, said : I would point out that the matters raised by Mr. Harland and one or two other speakers are very adequately dealt with in the Ministry of Works pamphlet on the management of building contracts. The subjects of delay in drawings and of nominated sub-contractors are very difficult and controversial subjects and have been the topic of discussion in Committees for at least two years. The difficulties that arise are not due to lack of education on the part of the architect or anybody else. There are complications to be faced, and I think the findings of the Ministry set out in the pamphlet to which I have referred show very clearly the great difficulties that exist and how impossible it is for building operations to have such an easy passage as we should wish.

The vote of thanks was put to the meeting and accorded with acclamation.

Mr. T. P. Bennett (in reply) : I thank you very sincerely for the way in which you have received my paper. I was afraid that the amount of detail which I thought was required might be found tedious.

With regard to the time for sending out invitations to tender on sub-contracts, to some extent that depends upon the size of the contract. In the case of small contracts I did not intend to suggest that the sub-contractor should be decided upon before the bills of quantities go out to tender, and it would conceivably mean delay. In larger contracts I have found that it is the only means of completing the drawings satisfactorily and that it is essential that tenders for things like steelwork and heating should be out and in while the main working drawings are being made ; that speeds up the contract. If the sub-contractor has any contribution of a practical order to make, it is disastrous if he makes it after the service in question has been included in a set of working drawings and issued to the builder. Therefore I regard this as a time-saving operation on all sizeable contracts.

With regard to the time from the issue of instructions by the client to the completion of the building, I have found in my experience that a clear statement to the client of the conditions under which the work is being done has always met with full appreciation. If we are working under licences and controls of various sorts and we tell the client so, he realises that they take time, and therefore what we are talking about is the saveable time and not the unavoidable time. To-day we are all working in a period of complete control, and the public have a remarkable ability to compare the work of one person with that of another. We are likely to be blamed not for our unavoidable errors but for those that we might correct.

As to the labour allocation, that is made on the application for the licence for the building and not on the tender which the builder sends in ; therefore it does not make any difference how many people send in tenders. The architect has to send in the application for the labour allocation.

I feel honoured that the Institute should take notice of my suggestions for a standard variation form and a sub-contracting form. I will give the Institute anything I can in that connection, and I sincerely hope it will be able to issue a form for the use of the profession as a whole.

With regard to the elimination of nominated sub-contractors as such, it is my experience that a builder and an architect can obtain an equally satisfactory tender from a sub-contractor, and I do not find that builders are able to get any better prices out of sub-contractors than I can myself, working on the same specifications and the same conditions. I think there are considerable advantages in these tenders being submitted to the consultant who asks for them and not included in the main contract, in order that the builder may obtain the sub-contract. The only advantage I can see in the alternative method, which is advocated very strongly by many builders, is that the sub-contractor submitting the tender to the builder may possibly feel that there is a closer relationship between them than if he submitted the tender to the consultant architect, but if a much tighter contract procedure such as I have advocated is employed that difficulty will not occur.

With regard to staff to fill up forms, I do assure those who are not used to these aids to smooth working that if they are used less time and not more time is occupied and these forms are of even more use to small firms than they are to large ones. If the Institute publishes a form of the various stages of the architect's job, such as I have shown on the screen, you simply buy a hundred forms or whatever number you require ; you pin one to your board and tick off the stage you have reached on the job, and you find it is of great assistance to you and no drawback at all. The time occupied in putting a tick on the form is negligible. I am quite sure that nobody who has once got used to these things will ever give them up. It is quite a fallacy to think that they can be used only in big offices ; they are of much greater value in small offices.

I agree with Mr. Macdonald that all this organisation is just as essential in the small office as it is in the big office. I should like to see it a *sine qua non* of operations in the profession as a whole, entirely regardless of size. The small office should make use of it so that it may still further reduce its staff.

No architect should have any difficulty in saying to his client : "It is not possible to get out your plans in less than three months, and the working drawings will take another six ; therefore if you instruct me on the 1st January the earliest date you can go to tender is the 1st September." The client may not like it, but he will certainly respect the architect when he goes to tender on the 1st September.

CONCRETE: ITS APPEARANCE AND DURABILITY

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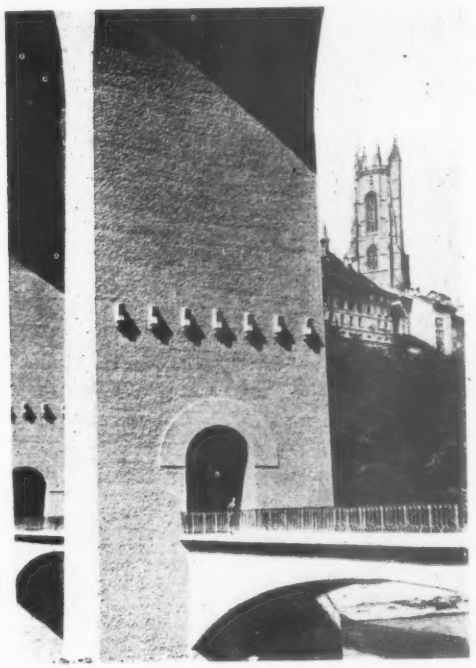
of the Building Research Station of the Department of Scientific and Industrial Research

A PAPER READ AT A MEETING ORGANISED BY THE ARCHITECTURAL SCIENCE BOARD AT THE R.I.B.A. ON WEDNESDAY, 29 NOVEMBER

Mr. C. G. Stillman [F.] in the chair



Concrete bridge at Fribourg, Switzerland, showing roughened surface.

In this paper I propose to restrict my remarks mainly to concrete for structural purposes—the heavy rather than the lightweight type, which latter Dr. Parker in his lecture* defined as concrete weighing less than 120 lb. per cu. ft. From the architectural point of view, perhaps the most important properties structural concrete should possess are homogeneity and high density—homogeneity to provide, amongst other things, for good appearance, and high density for durability. I must admit that much has been said and written on how such good quality concrete can be produced, but yet I think it is safe to say that the production of good concrete remains one of the most difficult and tantalising tasks confronting the architect, builder and engineer. It demands his close attention and control at all stages since, unfortunately, if control is relaxed at any time, so that blemishes occur in the concrete, it is doubtful whether subsequent repairs will succeed in rectifying the defects.

1. Controlling Factors in the Production of Concrete of Uniform Quality and of Good Appearance

No surface treatment by tooling, or other means, apart possibly from completely rendering over the surface, will conceal a piece of bad concrete, any more than colour washing will improve a bad drawing. The first essential, therefore, whatever the subsequent treatment of the surface, is the production of a uniform and homogeneous concrete—a clean background on which to work. To achieve this, care must be exercised first in the selection of materials, sand and coarse aggregates, and in the design of the mix; secondly, in the grading and workability of the mix; thirdly in mixing, placing and compacting the mix; fourthly, in the design of the formwork; and fifthly, in the after-care of the concrete.

* Published JOURNAL R.I.B.A., 1944 December.

(a) Selection of Materials

If things go wrong on a concreting job how often the blame has been put on the cement; whereas in fact this is the one material which seems least likely to go wrong, provided, of course, it is properly stored, off the ground and under cover, and not allowed to become stale and lumpy. Also it should not be used excessively, as this will lead to crazing and undue shrinkage. Only very rarely does normal Portland cement fail to come up to British Standard Specification requirements, although it may sometimes happen that rapid hardening Portland cement does not attain the high early strength expected of it.

In selecting sand for concrete work the following are the principal considerations to be borne in mind:

(i) the structure and composition of the grains, or particles;
(ii) their cleanliness and freedom from harmful impurities;
(iii) their size, shape and grading.

The mineral composition of the sand is important in so far as it affects the strength and resistance to wear of the finished concrete. The sand should be inert, i.e., chemically stable and of low porosity. The groups of material fulfilling these requirements are crushed granite, quartz rock, the densest sandstone, some limestones, and naturally occurring silicious sands. Washed sand only should be used for the best class work, since the presence of excessive amounts of clay, loam, silt, etc., may affect the setting of the cement, leading to a weak concrete, and prevent proper adhesion of the cement to the sand particles, and of the concrete to any reinforcing steel which it may contain. The presence of excessive silt and of organic impurities in sand can be detected by applying the simple tests specified by the D.S.I.R. and B.I.N.C. Codes, or in British Standard Specification 882.

With regard to shape of particles there are two schools of thought, one advocating "sharp" sand and the other "rounded" sand. In general, however, the sharp sand, being derived mainly from the residue accumulated during the crushing of stone for the production of larger sizes of aggregate, has clean freshly

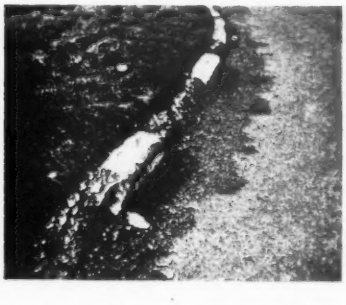
broken surfaces to which the cement adheres excellently, but the angularity, or "sharpness," of the grains tends to make the mix harsh-working, and in consequence may call for additional labour in placing it. Rounded, naturally occurring sand, on the other hand, although perhaps not having such good surfaces, tends to produce more workable concrete, easier to compact. On balance therefore there is little to choose, but it would be wise to avoid very sharp and splintery materials.

Sand is usually classed as that material 90 to 95 per cent. of which passes through 3/16 in. B.S. sieve. If it is natural sand or crushed gravel sand, it should generally contain not more than 10 per cent. passing through No. 100 B.S. sieve, or if derived from crushed stone not more than 15 per cent. With regard to the intermediate grain sizes, the following limits provide a useful guide.

TABLE 1

Passing B.S. Sieve	Per cent.	
	Natural sand or crushed gravel sand	Crushed stone sand
3/16 in.	90 to 100	90 to 100
No. 7	70 to 95	60 to 90
14	45 to 85	40 to 80
25	25 to 60	20 to 50
52	5 to 30	5 to 30
100	0 to 10	0 to 15

Much that has been said about sand applies equally to the coarse aggregate. This should consist of natural gravel, crushed gravel or crushed stone, or crushed blast furnace slag or crushed brick or other suitable ceramic body. It should be hard, strong, durable, clean and free from adherent coatings, and should contain no harmful material in sufficient quantity to affect the strength and durability of the concrete and, in the case of reinforced concrete, to attack the reinforcement. Mica, shale or similar laminated materials should not be present in quantities sufficient to affect the concrete. Certain crushed dolerites, sometimes erroneously referred to as crushed granite, have been found to contain minerals which render them unsuitable for use as concrete aggregates. Dolerites should therefore be used only when experience has shown that aggregates from a particular source have proved satisfactory. An illustration of the type of failure that may occur if unsuitable aggregates are used is shown in Fig. 1.



To left: Fig. 1.
Failure of concrete kerbs due to frost action on porous aggregate

To right: Fig. 2.
The results of insufficient consolidation and poorly made construction joints

In the first instance a porous limestone aggregate was used, and in consequence the concrete was unable to resist the action of frost.[a] In the second case, an unstable igneous aggregate had been used—its subsequent expansion leading to the disintegration of the concrete.

(b) Proportioning of Mix and Workability

The proportion of sand to coarse aggregate to be used will vary according to the degree of workability desired and the type of materials used, but normally it ranges from 50 to 70 per cent., those mixes with the higher proportion of sand being suitable for the more workable concrete. A proportion of sand higher than 70 per cent. is, however, not to be encouraged. Generally it will be found that if crushed rock is used as coarse aggregate, a rather higher proportion of sand will be required; also the proportion of sand should be increased as the sand itself becomes coarser; or as the percentage of fine material in the coarse aggregate becomes smaller. Different conditions of placing and compaction require different degrees of workability. For example, some, stiff harsh-working mixes which cannot be easily or properly placed by hand compaction can be placed efficiently by vibratory means to give excellent results.

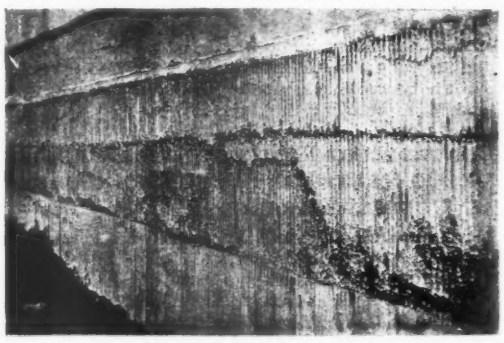
Under-sanded mixes should also be avoided, as their use will produce porous concrete.

(c) Mixing, Placing and Compaction

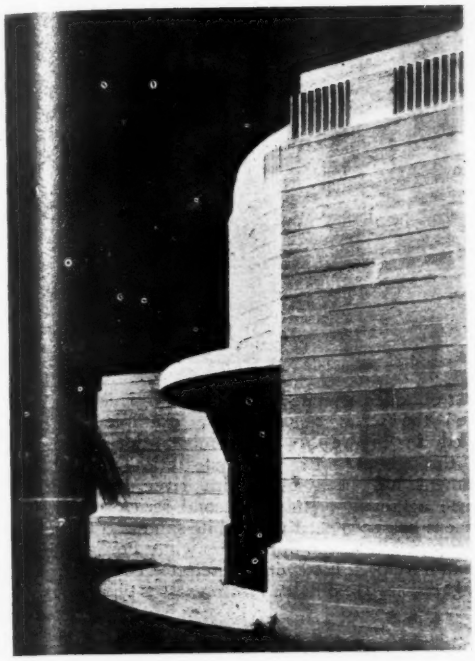
The methods of mixing, placing and compaction of the concrete play a most important part in determining its quality. Mixing must be sufficient to produce the uniform dispersal of the cement throughout the entire mix, so that all particles of the aggregate become coated. The water content must be precisely regulated if the best results are to be obtained. Wet concrete mixes will tend to segregate during placing, leaving an excess of coarse aggregate at the bottom of a pour, with an excess of fine material higher up, while at the top a layer of cement, fine sand, and water known as "laitance" will collect. This layer when set will have a chalky appearance, and will certainly prevent the effective bond of the succeeding pour of concrete to that already placed. The resistance to penetration of moisture, to weathering, to abrasion or erosion, and to chemical attack will be very poor at these laitance layers. On the other hand, concrete mixes which are too dry cannot be easily rammed into place, and tend to leave voids and honeycombed patches, which again offer little resistance to attack from external agencies.

There are on the market a number of proprietary materials which, when added to the concrete mix, act as dispersing agents, and give the mix greater workability.

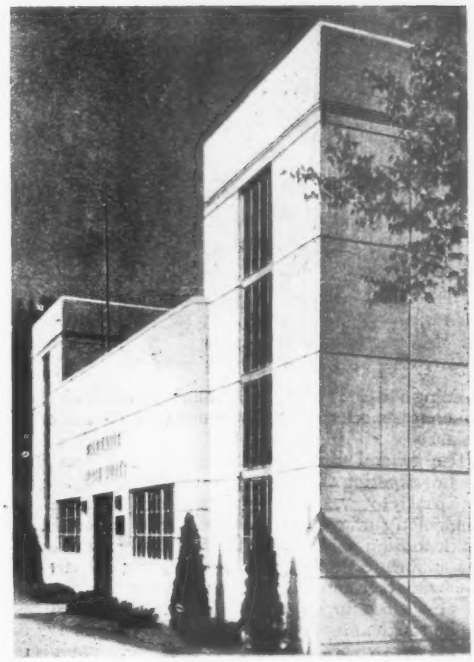
A word or two on placing. The mixing of the concrete should be carried out as close as possible to the point of deposition so that the distance of transit of the freshly mixed concrete is kept small. This will reduce the possibility of segregation of the mix. The concrete having arrived on the job should be deposited in the forms carefully, and not allowed to fall from a height, thus causing further segregation, and it should be spread evenly along the forms and not allowed to dump in a heap and allowed to flow along the forms to find its own level. The results of such a practice will be as disappointing as the case illustrated in Fig. 2. The concrete should be punned or vibrated uniformly over the



surface to produce a well-compacted mass, and not continued beyond the point when excess water begins to appear on the surface of the concrete. Excessive vibration is undesirable—in fact, the use of vibratory methods of compaction calls for just as much good judgment and just as much care in application as do hand methods of compaction. A careless workman, for example, who leaves an internal vibrator operating in one position, allowing it to sink slowly into the mass, perhaps while waiting for the next batch of concrete, instead of withdrawing it



To left : Fig. 3.
Entrance to waterworks at Fariboult, Minn., U.S.A. (*Photo : Cement and Concrete Assn.*)



To right : Fig. 4.
Community building at Tola, Kansas. (*Photo : Cement and Concrete Assn.*)

from the compacted mass, may do more harm than good. Over-vibration may also produce segregation of the mix. Vibration will not necessarily produce the best surface to concrete walls. The most recent experience, particularly in the United States of America, has shown that the increasing use of vibratory methods of compaction has led to an increase in surface voids and, in consequence, investigations have been undertaken to find means of reducing the trouble. This has led to the development and use of absorptive form linings of fibreboard covered with thin muslin, which absorb the excess moisture which collects on the inner surface of the forms during the process of vibration, and give to the concrete a smooth and even matt finish of pleasing appearance.

(d) Formwork

The importance of the design of formwork has already been dealt with in a previous lecture by Mr. Parry, and little need be said here except possibly that good appearance of a monolithic concrete structure more often than not depends more upon the treatment of formwork pattern than upon any other single factor, and that the pattern left by well-designed formwork often provides an excellent finish to the concrete.

The result of carelessness in the design of formwork, for example, the haphazard use of horizontal boards in one place, with vertical ones in another, with no consideration as to the resulting pattern that will be left on the concrete, or the use of odd sizes of board, is unpleasant. Subsequent attempts to obliterate such unsightly boardmarks by tooling or by any other method will not necessarily prove successful. It is possible, however, by careful control and design of formwork, even with horizontal and vertical boards on the same job, to achieve interesting results (Fig. 3). The photograph shows the entrance to the Waterworks at Fariboult, Minn., U.S.A. There are a number of other points which should be borne in mind. For example, tight formwork, in true alignment, is generally essential for good work; although, as shown in Fig. 4, by a careful control of the bulging of the boards of the formwork striking results can be achieved. The structure is the Community Building at Tola, Kansas. Boards should be matched in width, narrow-tongued and grooved boards usually producing the most pleasing surfaces. Old and new boards used together on the same work will produce very marked contrasts in tone and texture where each board has been. Under some circumstances this may, perhaps, not be objectionable. Wire form ties should not be used, since the wire, if left in the concrete, will cause unsightly rust stains.

(e) The After Care of Concrete

Once the concrete has been placed and consolidated, it should not be disturbed, but should be protected from the weather—from the effects of cold and of heat and drying winds—by applying suitable protective coverings. As soon as the formwork is removed the concrete should be sprayed liberally with water, and the operation repeated 24 hours later.

2. Finishing and Texturing

I do not propose to discuss the æsthetics of surface finishing, or to attempt to say which finishes to the concrete surfaces are, in my opinion, the most suitable under any particular set of conditions. The choice must be left to the individual architect. I have, however, attempted to put before you the basic essentials for the production of a homogeneous concrete with a surface as free from imperfections as possible, which can be worked or treated to give the desired finish.

(a) Types of Finish

The types of finish that can be adopted fall broadly into the following groups :—

(i) Smooth surfaces, as coming direct from the forms or linings; or with a light surface dressing by grinding or sandblasting—the latter method having been used recently in America to give excellent and pleasing results.

(ii) Rough surfaces produced by chipping away the hard surface of the concrete to reveal the aggregate.

(iii) The more expensive methods, particularly from the point of view of maintenance, of painting or rendering.

I do not propose to deal with this last group of treatments except to say that cement paints with satisfactory durability are available in this country. In a paper to the Institution of Civil Engineers,* I described the extensive tests carried out by the

* "The Surface Finishing of Concrete Structures."—Journ. Inst. of Civ. Eng., April 1942.

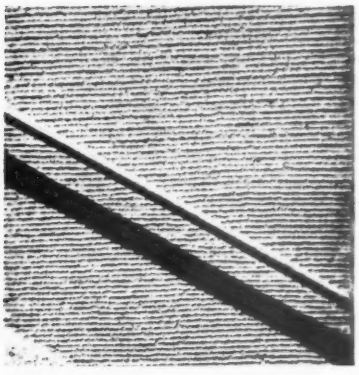
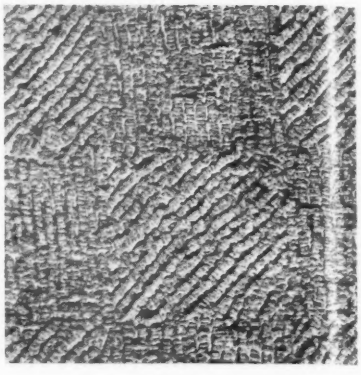


Fig. 5 *to left.* Fig. 6 *to right.*

Tooled surfaces on approach to the Kornhaus Bridge, Zürich.



Building Research Station in collaboration with the Cement and Concrete Association to study the effectiveness of various treatments.

The general conclusion from this work was that the tooled finishes exposing the aggregate were quite satisfactory, providing the concrete was homogeneous and of good quality. The roughened surfaces did, however, tend to darken as a result of the deposition of soot from the atmosphere, but as the darkening was uniform over the whole surface, and not streaky, as was the case with the smooth, as distinct from the matt, surfaces, this defect did not appear serious, and could at least be tolerated.

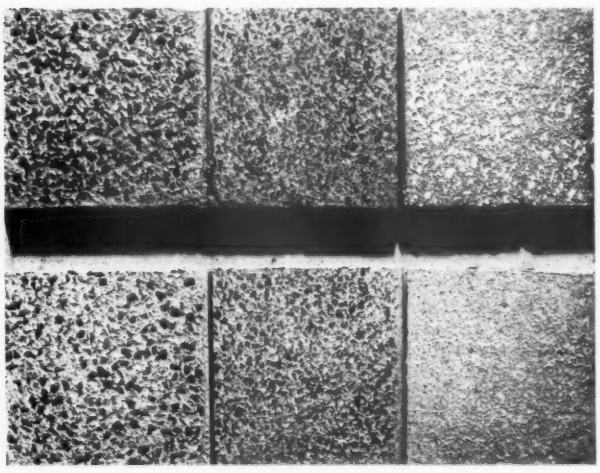
The roughening of the surface to expose the aggregates can be carried out by wire brushing the concrete while it is still "green," but more often than not roughening has to be performed later when the concrete has become too hard for the wire brushing to be effective. In this case the use of bush-hammers and chisels operated electrically or pneumatically are necessary. Many interesting surfaces have been produced, particularly on the Continent, by this last method, as illustrated in Figs. 5, 6, and headpiece.

(b) Colour

Colour can be imparted to the surface by any one of three ways :

(i) By using coloured aggregates;
(ii) by using pigmented cement;
(iii) by applying tinted renderings.

The least satisfactory of these is possibly the use of pigmented cements, and the most permanent and satisfactory results are those obtained by the use of selected aggregates, which, when exposed by either of the processes described above, impart the required colour to the surface. To illustrate the range of tones which can be obtained by choosing suitable aggregates, I have had prepared the series of slabs two examples of which are illustrated in Figure 7. The mixes are of identical proportions throughout. In the first series normal grey Portland cement has been used with river sand and the selected coarse aggregate ; in the second series, normal grey Portland cement has been used with white sand and the selected coarse aggregate, while in the third series white Portland cement and white sand have been used with the selected coarse aggregate. The coarse aggregates are obtained from various types of crushed brick.



It is possible, therefore, to obtain at one extreme excellent smooth matt surfaces, by the use of absorptive linings to the formwork, (Fig. 11) as used in America, but unfortunately not yet worked out in this country and at the other extreme rough mechanically treated surfaces—and to obtain satisfactory colour tones by the use and exposure of selected aggregates. It seems that little appreciation is given to the fact that a wide variety of coloured natural stones are available in Great Britain, and that a classified list of British quarries producing red, brown, black and green chippings has been published by the Road Research Laboratory, as Wartime Road Note No. 2, obtainable from H.M. Stationery Office, under the title of "Sources of Naturally Coloured Chippings in Great Britain." Particulars of the sources of supply of white and cream stones are also available.

When the selected aggregate is expensive or in short supply, consideration should be given to the possibility of using it in the form of thin precast slabs of concrete as permanent shutters to provide an external veneer to the main body of the concrete. As the concrete veneer slabs can be factory made under closely controlled conditions, very satisfactory results can be obtained by this method. One large and well-known building erected in London during the war was treated in this way, and the method seems to provide one good solution to the problem.

Fig. 7. Sample slabs to illustrate colour and texture variations.

1 : 2 : 4 BY VOLUME Ordinary Portland Cement. ⅛-in. Crushed Calcite Spar. ½-in. — ⅜-in. Crushed Matlock Limestone.	1 : 2 : 4 BY VOLUME Ordinary Portland Cement. ⅛-in. Crushed Calcite Spar. ½-in. — ⅜-in. Crushed Dorking Wirecut Bricks.	1 : 2 : 4 BY VOLUME Ordinary Portland Cement. ⅛-in. Crushed Calcite Spar. ½-in. — ⅜-in. Crushed Marland Stoneware Facing Bricks.
1 : 2 : 4 BY VOLUME White Portland Cement. ⅛-in. Crushed Calcite Spar. ½-in. — ⅜-in. Crushed Matlock Limestone.	1 : 2 : 4 BY VOLUME White Portland Cement. ⅛-in. Crushed Calcite Spar. ½ in. — ⅜-in. Crushed Dorking Wirecut Bricks.	1 : 2 : 4 BY VOLUME White Portland Cement. ⅛-in. Crushed Calcite Spar. ½-in. — ⅜-in. Crushed Marland Stoneware Facing Bricks.

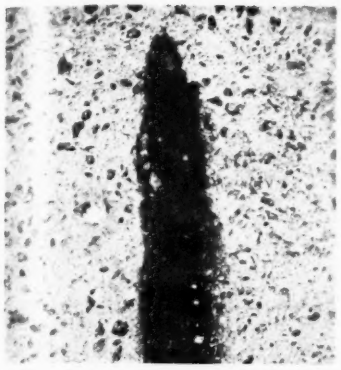


Fig. 8.—Staining caused by pyrites in the aggregate, or by inclusion of iron, wire, nails, etc., in the concrete.

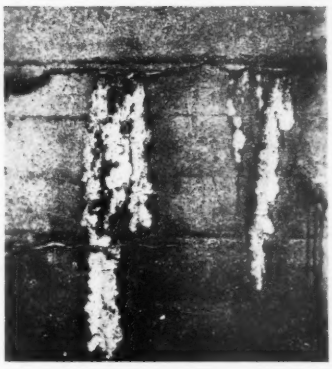


Fig. 9.—Defective construction joint allowing percolation of moisture, bringing with it chemical salts.

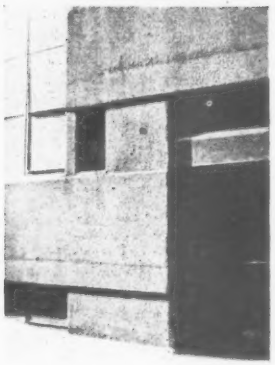


Fig. 10.—Disfigurement caused by construction joints.

(c) Surface Defects

I would like to draw attention to some of the surface defects that should be guarded against. First, the presence of pyrites in gravels from some deposits may on subsequent decomposition cause staining such as that shown in Fig. 8. Similar staining may result from the corrosion of wire form ties, odd pieces of binding wire, or nails accidently dropped or left in the forms; or if the cover to the reinforcing steel is insufficient to prevent corrosion.

As shown in Fig. 9, improperly made construction joints and joints between successive lifts will not only disfigure the surface of the concrete, but will allow the penetration of moisture. Their position should be carefully considered. Fig. 10 shows how construction joints can disfigure the façade of a building. If they can be masked by inserting tiles, or be positioned to coincide, for example, with a string course, the result will be more attractive. Special attention should be paid to the design of proper weatherings and flashings on all projecting features, cills, ledges, etc., so that rainwater is thrown clear of the walls. Many otherwise attractive buildings and structures have been disfigured by lack of attention to this matter. If rainwater is allowed to find its own path down the wall instead of being thrown clear it will flow in conspicuous runnels, carrying grime and corrosive agencies with it in doing so.

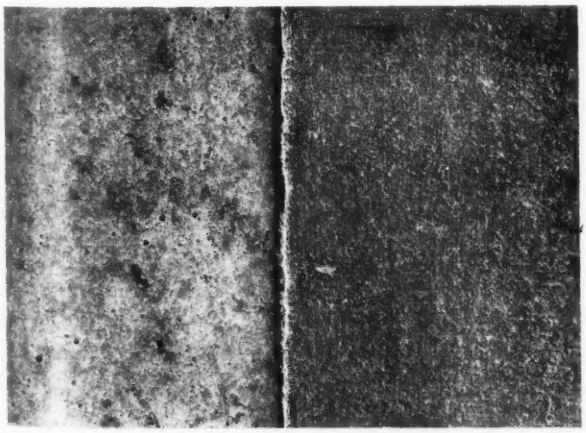


Fig. 11.—Sample showing, on left, concrete surface direct from steel plates and, on right, matt surface obtained by casting the concrete against absorbent board covered with muslin.

3. Basic Requirements for Concrete of Good Durability

For durability, to resist corrosion and erosion, it may be taken that the concrete should be as dense as possible and of good strength. The aim should be to choose and grade the aggregate carefully, to avoid oversanded mixes, to use sufficient but not an excess of cement, in order to reduce possible shrinkage trouble and to avoid surface crazing, and to use just sufficient water to enable the concrete to be placed readily in position to form a compact mass.

Temperature conditions prevailing at the time of mixing and placing also affect the quality of the concrete. The operation of concreting in cold weather, for example, is always a troublesome problem, calling for considerable care. The setting of the cement is stopped if the water in the mix freezes. Freshly placed or green concrete may be broken up by frost and the hardening of the concrete is thereby slowed down, even if it is not actually freezing. This means, of course, that the formwork cannot be stripped at the right time. In normal winter conditions, therefore, the aggregate, fine and coarse as well as the cement, should be stored in a sheltered place out of the cold and wet. The concrete-mixing plant should also be installed in a sheltered place, and mixing should not be commenced until the air temperature has reached 34° F., and should be stopped again if the air temperature shows no sign of reaching 38° F. If the air temperature is falling, stop concreting at 38° F. On stopping the work, all concrete already placed should be covered with tarpaulins, or layers of tar paper, cement sacks and the like. The concrete should subsequently be inspected to make sure that it has not frozen, taking particular care not to mistake frozen concrete for hardened concrete. Careful judgment will need to be exercised as to the time at which the formwork may be stripped, but the minimum times given in Table 2 may be taken as a guide.

Table 2
Minimum Times for Stripping Formwork

Stripping of Formwork	Normal Portland Cement Concrete	
	Cold weather (just above freezing)	Normal weather (about 60°F.)
Beam sides, walls and columns (unloaded)	6	1
Slabs (props left under)	10	3
Removal of props to slabs	14	7
Beam soffits (props left under)	12	7
Removal of props to beams	28	16

In prolonged severe weather, additional precautions, such as preheating the water and aggregate, may have to be taken, and possibly measures to heat the formwork and to apply heat to the newly placed concrete. The mixing water can be heated in one or other of the following ways :—

(i) By steam jet or steam coil in the supply tank ;
(ii) By domestic type of water heater in circuit;
or (iii) By passing it through a coil in a large coke stove.

The water should be heated to 150° F. for the first few mixes until the mixers, barrows, etc., are warm, after which the water temperature may be reduced to 120° F.

The aggregate can be heated by heaping it over corrugated iron staging on dwarf brick walls with a fire underneath, or by steam pipes passing through the stock piles.

The formwork and reinforcement can be heated by applying hot water to them, or by applying steam from a boiler through a hose-pipe fitted with valve connections to regulate the flow as required.

Again in severe weather after the concrete is placed, it should be protected from cold winds by enclosing the work with tarpaulins or canvas screens, and heating by means of braziers or steam pipes. Low pressure steam is useful, because it prevents the concrete drying out, a point to be guarded against if braziers are used.

Admixtures of calcium chloride have been successfully used in cold weather, though in general the preheating methods indicated above are still to be preferred. The amount of calcium chloride usually added is 2 lb., as normally manufactured for use in concrete, to 1 cwt. of cement. If obtained in lump form, it must be dissolved in water before it reaches the concrete materials. It is possible, however, to purchase flaked calcium chloride, in which case it may be used solid. Cements are obtainable with the calcium chloride already incorporated. The user of calcium chloride should satisfy himself, by enquiry of the manufacturer, that the material he is buying is of suitable grade for the work in question.

At temperatures below normal, but which do not fall below freezing point, the addition of calcium chloride is advantageous, and accelerates the setting of the concrete and improves its strength at early ages. The rate of strength development at temperatures of 32° F. to 35° F., is still, however, below that of the concrete without calcium chloride addition at "normal" temperatures, and to obtain a proper degree of hardening for urgent work it is necessary to use preheating as well. At temperatures which fall more than 2° or 3° below freezing point, the addition of calcium chloride cannot be relied upon to give protection against freezing, while in any event the rate of strength development becomes very slow, and other additional precautions such as preheating should therefore be adopted.

(a) Resistance to Frost Action

If concrete is cracked by excessive shrinkage, or has a crazed surface, or is honeycombed or porous, moisture may penetrate, and if this should subsequently freeze, ice so formed in the pores of the concrete may disrupt the concrete, causing it to spall. The disintegration will be progressive, as the spalling or flaking opens up fresh concrete to attack. Segregated patches and porous laitance planes, which as already noted may occur at faulty construction joints, are a source of danger and may suffer very severely from frost attack. The use of soft aggregates and aggregate with dusty or clayey surfaces, which prevent the proper adhesion of the cement, also increases the risk of frost attack.

(b) Resistance to Chemical Attack

For similar reasons, defective concrete will not resist the action of inorganic salts entering the concrete in solution in water. The chemicals are mainly mineral sulphates such as those of calcium, magnesium, sodium and potassium, and these occur in various types of soils, ground waters, sea-waters, sewage effluents, and factory wastes. They combine with the free calcium hydroxide or with the hydrated calcium aluminate in the concrete to form salts which decompose the concrete. In the case of

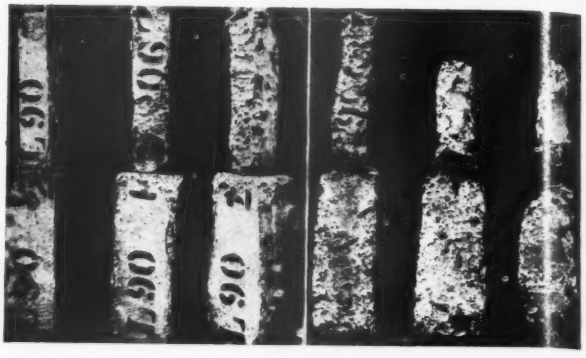


Fig. 12.—Reinforced concrete prisms after immersion in magnesium sulphate solution. The slump of concrete varied from ½ in. on the left to 6 in. on the extreme right, and shows the poor resistance to attack of concrete with a high water cement ratio.

reinforced concrete, e.g., piles, retaining walls, tunnels, tanks, etc., it is doubly important to provide an adequate thickness of dense concrete cover to the steel. If moisture should penetrate to the steel, possibly carrying with it deleterious chemicals, corrosion of the steel is certain. Although in the first instance penetration to the steel may only have occurred at one small point in the concrete cover, the corrosion may spread along the length of the bar, eventually causing the cover to spall away, fully exposing the steel to further attack. Concrete of high quality is essential, therefore, for reinforced concrete work, in order to prevent access of moisture and air to the steel. If this is obtained, the reinforcing steel is, under ordinary conditions, adequately protected. Fig. 12 shows a series of reinforced rapid-hardening Portland cement concrete bars of varying workability (from ½ in. to 6 in. slump), which were immersed for a period in a 10 per cent. solution of magnesium sulphate, and indicates well the importance of using a low water content.

Extensive tests by the B.R.S. on many reinforced concrete piles made with differing types of cement, with mixes of varying proportions and workability and with different depths of cover

Fig. 13.—A concrete breakwater which failed primarily on account of faulty construction joints.

to the steel, exposed to the tidal action of sea water, both temperate and tropical, over a large number of years, has indicated that for normal Portland cement concrete a minimum cover of not less than two inches should be provided, and that the mix should be of stiff consistence with a slump not exceeding one inch. Fig. 13 shows a concrete breakwater which failed mainly because of poor construction joints; while Fig. 14 shows another breakwater in which blastfurnace slag aggregate was used still in good condition after sixty years.

Serious corrosion may occur from sulphate and chloride attack in Portland cement concrete pipes and other concrete products buried in the soil, and it is for this reason that the more resistant high alumina cement concrete is sometimes used instead, but it

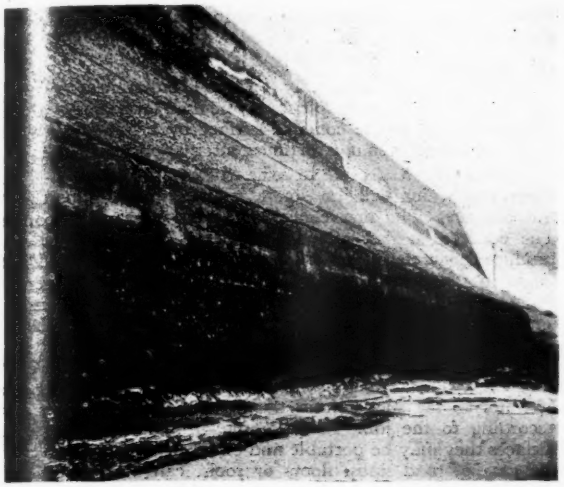


Fig. 14.—A concrete breakwater made with blastfurnace slag aggregate, after 60 years' exposure to sea action.

should be borne in mind that unless the mix is dense this type of concrete may also be attacked.

Petrol, fuel, oil and petroleum distillates in general do not attack matured concrete, excepting possibly creosotes containing phenols, etc. It is, however, a matter of considerable difficulty to make a concrete impermeable to the lighter oils.

Lactic acid, arising from the souring of milk, acetic acid, encountered in vinegar and various pickling processes, and in certain other industries, and tartaric acid, a constituent of fruit juices, will, even in dilute solutions, attack set Portland cement concrete. Oleic, stearic and palmitic oils encountered in industry as constituents of oils and fats all have a very definite effect on concrete. In general, vegetable oils and fats have a destructive action on Portland cement, and the attack is more rapid when the oil is freely exposed to air and moisture, as when spilt on the floor. Although sugar solutions do not, in the cold, have a very marked action on dense well-matured Portland cement concrete, hot sugar solutions or sugar liquids which have fermented, such as might be encountered in jam factories, have a destructive effect. Generally, alumina cement concrete is more resistant to these materials.

The first essential requirement, therefore, if the concrete is to resist chemical attack, is that it should be dense, and of low porosity. Wet mixes are vulnerable to attack, and mixes too dry to compact properly are to be avoided, while prolonged curing of the concrete so as to form a protective film of calcium carbonate on its surface will enable it to resist the attack more effectively.

(c) Fire Resistance

Structures made from concrete possess good fire-resistant properties. By this is meant that the concrete itself possesses the ability to withstand heat and the subsequent action of water without losing strength unduly, and without cracking or spalling. In this the concrete is helped by the fact that it possesses low thermal conductivity and has a high heat capacity. In the case of reinforced concrete, however, it is only a matter of time before exposure to fire will result in sufficient heat reaching the steel to cause it to expand or buckle and push off the protecting cover. Again, some aggregates tend to split and disintegrate under the action of heat, or on subsequent quenching with water, and this will reduce the effectiveness of the cover. Flint aggregate does this, but blastfurnace slag, some limestones and crushed brick are less prone to this defect, and in general give better protection. Also recent tests have shown that if the concrete cover, although cracked and partially disintegrated by the action of heat, is held in position by light gauge wire mesh embedded in it, thus maintaining a protective cover to the steel, the resistance of the structural member is greatly increased.

Concrete encasements to steelwork, either in the form of precast blocks, or cast *in situ*, using slag or crushed brick aggregate, also afford a high order of protection if properly held to the steel member by wire mesh or wire reinforcement.

Many reinforced concrete buildings and structural members have been damaged by fire during the war period, and it may be appropriate here to comment on the assessment of possible damage and on methods of repair. The after-effects of fire on reinforced concrete structural members vary with the maximum temperature reached, the time during which the temperature remains high, the rates of heating and cooling, the nature of the aggregate, and the composition of the concrete. When the temperature of the concrete reaches 300° C., oxidation of small quantities of iron present in the sand produces a characteristic pink colour. The pink layer increases in depth as heat penetrates, and this discoloration may be taken as a rough guide to the extent of possible injury to the concrete. Extensive exposure of reinforcement and marked discoloration of the surface concrete should not, however, be taken to indicate that the member is beyond repair. Loose and softened concrete should be cut away with care, and with the least shock to adjoining concrete. Hard concrete, although tinged to a pink colour, may be allowed to remain, provided that the remaining concrete in the member is sufficiently thick and sound to justify repair. Wire reinforcement or mesh should be attached to the main reinforcing bars before replacing the concrete cover, so as to provide mechanical bond. It may be necessary for obtaining tying in of the new work to the old to cut away some of the undamaged concrete.

(d) Resistance to Wear

One of the main uses of concrete in building construction and estate development is for floors, footpaths, roads, etc., and good resistance to all forms of wear is required. Vast areas of concrete floors have been laid during the war period, mainly in factories and hutments, and the experience gained has been of the greatest value, and the following paragraphs are based on a note prepared recently at the Building Research Station on the subject.

Concrete floors may be either of two main types, (*a*) self-finished concrete with no special finishing course, or (*b*) granolithic type with a special finishing course having a specially selected aggregate. Heavy duty floors are usually of the second type and the requirements for attaining satisfactory results with this type are as follows :—

The aggregates should be of an approved type of hard natural rock and of suitable grading, and should all pass a $\frac{3}{8}$ in. sieve. They should conform to the requirements of the British Standard Specification for aggregates for granolithic floor finishes—B.S.882. The mix should normally be 1 cement: 1 fine aggregate: 2 coarse aggregate, or 1 cement to $2\frac{1}{2}$ of mixed aggregate, all proportioned by volume. The water content should be the minimum necessary to give sufficient workability for laying and compacting.

Where possible, the finishing should be laid as soon as the concrete base has hardened sufficiently to bear the workman's weight. If it is laid on a hardened base, it should be not less than $1\frac{1}{2}$ in. thick; if laid before the base has hardened, it should be not less than $\frac{3}{4}$ in. thick. The base should be thoroughly cleaned, and, if hardened, should be roughened by chipping or by other suitable treatment. The surface should be wetted, preferably overnight, a grout of neat cement or cement and sand should be brushed on immediately before laying the surface concrete. This grout must on no account be allowed to dry out before placing the first layer. When laying on a hardened base, the finish may be applied in one or two layers. In the latter case the underlying layer should be placed and levelled so that the finishing layer has a thickness of not less than $\frac{1}{2}$ in. It should be

thoroughly compacted by punning or rolling. The top layer should be immediately applied and levelled and compacted by a screeding board or other convenient means.

Finishing should be carried out with a float and trowel; the period after laying at which the trowelling is carried out is very important. Only just sufficient to give a level surface is done immediately after laying, and further compaction and finish is given later at intervals up to some hours, when the mix has stiffened sufficiently, so that a hard compacted surface can be attained without bringing laitance to the surface. No application of dry cement or rich cement-sand slurry to the surface should be permitted. The floor should be kept damp for a minimum period of seven days, and during this period should not be exposed to any traffic.

(e) Hardening of Existing Concrete and Granolithic Floors

Treatments of various types are given to concrete or granolithic floors for the purpose of hardening the surface and reducing "dusting" and abrasion. The following types, which have been used successfully on floors of reasonably good quality, may be mentioned. Floor surfaces which are weak and friable, or otherwise of poor quality, cannot be effectively treated.

(i) Silicate treatment

The sodium silicate should have a suitable soda-silica ratio, and hence should be of a grade sold for the purpose. An example is Grade P84 sold by Imperial Chemical Industries, Ltd.

The surface to be treated must be clean, since the solution will not penetrate into concrete covered by a film of grease or oil. In some cases sweeping to remove dirt and dust may be adequate, but usually, and always with old floors, additional cleaning is necessary. The surface should be wetted with soapy water and scrubbed with a wire brush or fine steel wool, then mopped, and a final scrubbing given with soapy water using a fibre brush. The floor must be allowed to dry so that the sodium silicate solution can be absorbed into the surface. In applying the treatment, a solution containing one part of sodium silicate to four to six parts of water is sprayed over the surface, and spread evenly with a mop or soft brush; the weaker solution is used on the less absorptive surfaces. Any excess is wiped off and the concrete allowed to dry. This will require 24 hours or more, according to conditions. The surface should preferably then be washed with water and again allowed to dry before applying a second coat containing one part sodium silicate to three or four parts of water. This coat should similarly be allowed to dry and be washed to remove any free soda formed. A third coat may be applied if the concrete is still porous. The life of the sodium silicate treatment varies with the quality of the concrete, and the floor may need retreatment after one or two years.

Magnesium or zinc silico-fluorides may be purchased as fine white crystals from any chemical suppliers, or in proprietary form from various manufacturers. The crystals are dissolved in water, 1 lb. per gallon being used in the first coat, and 2 lb. per gallon in subsequent coats. Three coats are usually applied at 24 hour intervals; there is no need in this case to wash between coats or after treatment.

(ii) Oil treatment

Drying oils, and preferably Tung oil, either neat or thinned with turpentine or white spirit, may be used for a similar purpose. This is applied to the concrete surface by brushing, any excess being wiped off about two hours after application.

In closing I would like to refer to two processes in the art of concreting which will, no doubt, assume greater importance in this country. The first concerns the use of vacuum concrete. The concrete is first mixed with an amount of water which produces concrete of good workability, and this is placed in the forms in the normal way. The excess water is then removed from the freshly placed concrete by a process which consists of applying suction through specially designed mats. These mats consist of an airtight backing of rubber, metal or wood, faced on the side in contact with the concrete with a filter fabric behind which is a series of channels or passageways to permit the flow of water to the suction outlet. The design of the mats varies according to the job. For example, for horizontal or sloping surfaces they may be portable and either flexible or rigid, and in the case of road slabs, floors or roofs, can be applied to the exposed surface of the wet concrete as fast as it is placed and levelled off. For vertical surfaces such as walls, etc., they may constitute that part of the formwork which is in contact with the concrete, and the vacuum may be applied to either one or both faces, depending on the thickness of the wall. The process is controlled in America by the Vacuum Concrete Corporation.

The other development concerns the pre-stressing of the steel reinforcement in concrete. The advantages of the system are well known. In the normal methods at present used in this country, the reinforcing steel is subjected to stress *before* the concrete is placed, and the stress is released only when the concrete has hardened sufficiently to provide adequate bond between the steel and concrete. In the latest method, used in America, the concrete is allowed to harden *before* the stress is applied, and the bond to the steel restored after stressing. Briefly, the reinforcing rods are first coated with a thermoplastic material such as sulphur or low-melting alloys. In the case of sulphur, the coating may be obtained by dipping the rods in molten sulphur, which may contain a filler of fibrous material such as asbestos. When the rods are assembled in the structure, concreting is carried out in the normal manner, and the concrete surrounding the rods is allowed to harden fully. To stress the steel, an electric current is passed through the rods, causing them to heat up and so soften the thermo-plastic coating, and at the same time increasing the length of the rods by thermal expansion. The amount of expansion desired is maintained by means of adjusting nuts on the threaded ends of the rods. When the current is stopped, the steel cools and the thermoplastic coating resolidifies, thus restoring the bond between the steel rods and the surrounding concrete.

The discussion that followed Dr. Davey's paper and also the discussion after the paper by Dr. Parker on lightweight concrete will be published in the next issue.

Book Reviews

Architecture and Personalities, by Herbert Baker. 8vo. xii+224+plates. (Country Life). 1944. £2 2s.

REVIEWED BY A. B. KNAPP-FISHER [*F.*], HON. A.R.C.A.

"For books are not absolutely dead things, but do contain a potency of life in them to be as active as that soul was whose progeny they are."
Areopagitica, John Milton.

It is difficult in reading this book not to be led into a description of the author.

Books are necessarily revealing, and Sir Herbert Baker in writing his autobiography at the age of eighty portrays a man of many parts, ever in search of the work which he loved and lived for. It is stated by the publishers that this is the first autobiography to be written by a leading English architect, and beautifully produced it is.

From the outset it is clear, I think, that it has not been an easy book to write. Without reference to any diary Sir Herbert delves into the past and unfurls a sheaf of memories which in their astonishing range and variety of scene are vouchsafed to few architects.

Under the heading "A Man of Kent" the author reveals himself as one born and bred in an English home amongst English fields and woods, instilling in him a deep feeling for nature. His house, a typical homestead of the 17th century, bred in him a love of home, its landscape and surroundings; and we like him the more for his love of cricket and riding. He tells us how, at this time, he entered the office of Ernest George and Peto, when Guy Dawber, Herbert Read and Schultz Weir were their assistants, and of how he first met Lutyens there "who though joking through his first pupilage, quickly absorbed all that was best worth learning." Sir Herbert at this time passed his associate R.I.B.A. top of the list, and gained the Ashpital Prize.

In the chapter headed "The Cape of Good Hope," the author tells us how he was impatient with the dull period of the early nineties and decided to set out for a land which promised greater opportunities—to a country which had already fired the imagination of Cecil Rhodes. His description of his first weeks in South Africa and how he absorbed what Rhodes also saw and held in such reverence is fascinating reading. "This is the land for me," he exclaims on visiting Table Mountain for the first time.

Truly Sir Herbert may be said to have conquered the land of his first choice, and to have left it the richer for his buildings there. His meeting with Rhodes is romantic enough: while walking early one morning at the foot of the mountain below Groote Schuur, Rhodes stopped and spoke to him and asked him to breakfast, as he wanted as he said "to build his house." "This happy meeting and invitation determined my fortune," says Sir Herbert.

The spirit of Rhodes deeply implanted itself in him, and with justifiable pride he must have entered into the building of Groote Schuur, so delightfully described in the book, later to be followed by Rhodes's memorial on Table Mountain amidst oaks, pines, and protea trees, where Rhodes was wont to sit and dream his dreams.

Later still he was to design South Africa House and Rhodes House, Oxford, about which he writes: "no work that fortune brought me gave me greater satisfaction than that of building the Oxford House of the spirit of my first patron and friend."

Sir Herbert Baker's travels at this time in Egypt, Greece, Italy and Sicily are reflected in his work in South Africa and elsewhere; and he describes how the past can be and remain a living thing, and how the artist can recoin the old gold to the stamp of his new needs and visions.

In chapter four the author relates how that Lord Milner invited him to the Transvaal; and so with the prospect of abundant work, we see him setting out once more on his adventures.

The amount of work Sir Herbert did in South Africa was astonishing, chief of which were the Union Buildings, Pretoria, at the age of forty, Government House, "The Kindergarten," and three Cathedrals. In addition he built many houses and churches. Some of these buildings are delightfully illustrated.

At the beginning of his chaper on India, Sir Herbert describes the excitement he experienced in opening in Rome a telegram from the India Office asking whether he would collaborate with Lutyens in designing New Delhi. He had kept in touch with Lutyens by correspondence and saw much of him when he was in England. "I foresaw," he writes, "that in spite of our long friendship, there might be troubles ahead when we came to collaborate in the sensitive realms of art."

So opens a description of what the author calls "the glamour of the great Imperial Quest." An achievement which is only paralleled by Rome in her greatest days.

In his chapter on his many War Memorials and War Cemeteries, the author describes the years he spent on the work of the War Cloister at Winchester as among the happiest of his life. It was, as he has written, a work after his own heart, and few will quarrel over its merit. A synthesis of strength and grace. Kipling's eulogy of it, quoted in full, will be, I believe, echoed by all who have eyes to see; a Memorial where peace and reverence abide amid the clangour of an unsettled world.

Sir Herbert Baker was invited to East Africa in 1925 to Kenya and Uganda, "a country of romance and mystery," and soon we hear of him adding still more buildings to his record: Government House and Governor's House at Kenya, to mention only two. At that time he also visited America with General Smuts and Philip Kerr, now Lord Lothian, which he describes amongst the most valued experiences of his life.

But in the end he was called to London by the Deputy Governor of the Bank of England to tackle another monster job of national importance, the rebuilding of the Bank itself. Further banks and Church House followed and many other buildings in town and country, including both Oxford and Cambridge.

Sir Herbert's chapter towards the end of the book on "The Allied Arts" is full of philosophic significance, as delightful to read as it is provocative of thought. I have no hesitation in recommending it to all who think on these things, architect and student alike.

Sir Herbert Baker swells the heart with his panorama of Empire as seen through the eye of an architect. Phenomenal also is the long succession of his friends: Smuts, Kipling, T. E. Lawrence to mention only three and over and above all the brooding spirit of Rhodes.

The book will remain for all time the record of achievements of a notable architect absorbed and engrossed in the work which poured in on him in many lands during stirring times—it is a book to read and ponder over.

Towards a Plan for Oxford City, by Lawrence Dale. 8vo. 60 + 9 plates. Faber. 1944. 6s.

REVIEWED BY A. TRYSTAN EDWARDS [*F.*]

These proposals for the creation of a new traffic road skirting Christ Church meadow have aroused fierce controversy, yet even the bitterest opponents of the scheme have been compelled to acknowledge that it has been expounded in a book distinguished not only for its forceful argumentation but for its urbanity. Indeed the present writer is so much impressed by the quality of this book that before entering upon a discussion concerning its contents he feels obliged, in all humility, to utter the following reproach to Mr. Lawrence Dale. How has it come about that so powerful a pen has not previously been employed to promote the interests of civic design? Henceforth no preoccupation with his professional practice will be considered an adequate excuse for not exercising his redoubtable gifts as a controversialist on behalf of architectural causes which need literary champions!

Although this book, on account of its distinguished presentation, has been well received at the University of Oxford, the scheme which is outlined in it has been subject to a number of criticisms. But when discussing a major project of reconstruction it is well to remember that there will always be a solid phalanx of ultra-conservatives, constitutional devotees of the line of least resistance, who will oppose *any* change, no matter how desirable and necessary it may be.

What honest person at all acquainted with the Oxford of to-day will deny that drastic measures of planning and control need to be taken if this mediæval city is to adapt itself to twentieth-century conditions and at the same time preserve its characteristic dignity and charm? In Mr. Lawrence Dale's learned discourse, divided into four sections—Prologue, Analysis, Synthesis and Epilogue—he gives a remarkably clear account of the historic causes leading up to the present "impasse" at Oxford and he also does full justice to the attempts of others to find a remedy for it. The word "impasse" may here be used in its most literal sense, for in certain parts of Oxford, notably at Carfax, the con-

gestion of both vehicular and pedestrian traffic is perhaps greater than that to be encountered in any other town in the kingdom. It is sad indeed that such indignity and inconvenience are inflicted upon a city which needs to obtain the repose and quietude appropriate to a seat of learning. Nobody has yet suggested that the University itself should be moved. The alternative course, which is to move the great industrial centre at Cowley, the presence of which is the main cause of the trouble, is not immediately practicable. One may note here, in passing, that as far as the pedestrian traffic is concerned the congestion would have been considerably less than it now is if the new Cowley had been properly planned as a compact township with its own shopping and amusement centres instead of as a vast sprawling Garden City offering to its inhabitants few of the amenities of a civilised existence. In that event Woolworth's, for instance, would have been content to set up a new establishment at Cowley instead of purchasing the Clarendon, thus further overcrowding the pavements in Cornmarket Street while at the same time depriving Oxford of much needed hotel accommodation.

Unfortunately the policy of industrial decentralisation which strongly commends itself to those who want Oxford to remain predominantly a University town, is opposed by a number of people who profess to have the best interests of the city at heart. Few municipal authorities can nowadays resist the lure of increased rateable values and even College Bursars are not averse to receiving on behalf of their foundations increased ground rents which result from the urbanisation of farm land administered by them. In some quarters it has even been seriously proposed that Oxford should become the sub-capital of a Region embracing several counties and should seek to acquire a population of a quarter of a million. Where this additional number of inhabitants are to come from, whether by denuding the surrounding villages of most of the folk who now dwell there or by a phenomenal speeding up of the birth-rate in the city of Oxford itself is not clear. The immediate problem, however, and the one to which Mr. Lawrence Dale addresses himself, is that of making more tolerable the urban conditions of the population of 100,000 or so who now live in the area including Oxford itself and the modern industrial township of Cowley.

Hitherto attempts to relieve the congestion of the vehicular traffic have been confined to the creation of by-pass roads. As Mr. Dale points out, however, there is not the slightest prospect that a multiplication or extension of such roads will solve the problem. Many of the numerous by-pass and "ring" roads laid out at such expense in the inter-war period have failed to fulfil the purpose for which they were planned and their principal effect has been to make it easier for the speculative builder to spoil the countryside. Mr. Dale shows that what is needed at Oxford is a marked improvement of traffic facilities within the confines of the city itself. He recommends the planning of an entirely new route which will relieve the traffic in the Cornmarket, the High, the Broad and Holywell *without* by-passing Oxford and without interfering with the ancient streets lined by buildings of great beauty and historic interest.

The thesis that the only place for such a route is on the edge of Christ Church Meadow is brilliantly argued, especial attention being paid to the æsthetic aspects of the project. While those representatives of the University and of the City Council who oppose the scheme are now in a slight majority, it may be hoped that in the not distant future the matter will be reconsidered and that the proposals in their entirety, or perhaps in a slightly amended form, may be accepted.

The book is illustrated by a number of elegant plans and perspective drawings by the author who is at pains to show that his scheme will not only solve the traffic difficulties but that the developments associated with it would revitalise Oxford in every way. Readers of this Journal may be recommended to study Mr. Lawrence Dale's book with the most serious attention. It is an admirable example of the architectural approach to town planning.

Building Scotland, by Alan Reiach and Robert Hurd for the Saltire Society. sm. 4to. The Saltire Society. Edinburgh. 2nd edn. 1944.

REVIEWED BY OLIVER HILL, [*F.*]

There could be nothing but praise to offer the Saltire Society for their revised and enlarged edition of *Building Scotland*. This is a cautionary guide by Alan Reiach and Robert Hurd, who present, by means of contrasts and comparisons, a theme in the form of an argument in pictures linked by a running commentary. Each double page opens on some varied and important aspect such as housing, the design of public works, transport buildings, buildings for recreation, hospitals, schools, commercial buildings, civil buildings, churches, etc., in which the good and bad ways of building are made clear by juxtaposition. The authors drive their point home in emphasising good and bad architectural manner by showing the two Scotlands the "show piece" and "the skeleton in the cupboard."

The underlying tragedy is that until the short space of a hundred years or so ago, the face of Scotland abounded with humble unpretentious yet lovely vernacular buildings such as the harled and whitewashed Caithness churches at Dunnet and Reay, fishing villages like Crail and many others on the Fife coast and simple villages as Gifford with occasional classic surprises of such distinction as Inverary. These and the grand old bridges, as that of Stirling, were built all over Scotland in the ordinary traditional way, in fact there was no other way. That we should now refer to them as "show-pieces" is an indication of the depths to which we have since fallen from grace.

Building Scotland is a challenge to all patriotic Scotsmen to put an end to the follies and mistakes in building that menace their heritage It must reach every town and county councillor, every library and every bookstall in Scotland.

Its message is presented with such admirable directness that it is hard to believe that anyone reading it could fail to be goaded into action or at least preventive action where that is necessary.

As an indication of future possibilities there are excellent photographs of sparkling Scandinavian, Czechoslovakian, Swiss and American contemporary buildings which it would be well for everyone concerned in the provision of such things here to study with care, though we have to remember that the character of our Northern climate calls for a certain sensitiveness in the use of material which does not necessarily arise in the crystal-clear atmosphere of Switzerland, for instance, or in the summer conditions of the Baltic.

In our case, such buildings would probably need the introduction of a certain amount of native material in their facing to ensure their weathering and harmonising with the essential softness of our climate.

It is to be hoped that the message of this book may be the means of instilling pride in every Scottish breast; that a stop may be called to further ravages by ill-considered and shoddy building and that it will help the Scots to plan gravely, worthily and nobly for the future of their incomparable land.

Correspondence

THE LUTYENS MEMORIAL

13 Mansfield Street.

To the Editor, JOURNAL R.I.B.A.

DEAR SIR,—In the September issue of your JOURNAL you kindly reproduced a copy of a letter that was published in *The Times* on 22 August last, signed by members of my Committee, appealing for funds for a Memorial to the late Sir Edwin Lutyens. I should be grateful if the objects of my Committee could be published in the next issue of your JOURNAL for the benefit of your members and to give publicity to them.

Our objects are to assist in guaranteeing the publication of a number of commemorative volumes embodying a permanent record of the late Sir Edwin Lutyens's architectural achievement, and to endow an annual Scholarship for architectural students. Each of the volumes will deal with a definite category of his work, containing relevant biographical and factual information and will be illustrated by scale drawings, plans and photographs.

The production of these volumes will involve a great deal of patient research, and is likely to demand an outlay a good deal in excess of what would be regarded as normal to a purely commercial undertaking. The Memorial Fund, therefore, must be a substantial one if it is to serve as a guarantee fund for the expenses which will be incurred.

To ensure that there is a guarantee that these volumes will be a noble and lasting record of his work, our immediate objective is to have as many names as possible on the subscription list, which we earnestly hope will be as representative of the Architectural Profession as it can be made, for nothing else would be a fitting commemoration of so outstanding an architect.

No Architectural Library will be complete without these volumes, and it is hoped that they will in due course pay to a great extent for the cost of their production. The intention is that any balance in the Fund will become available for the foundation of a Scholarship, which is the secondary object of our appeal.

The advantage of subscribing to the Memorial Fund will be well worth while, as it is intended that such subscribers will receive a special discount of 25 per cent. on the published price of the volumes. Donations will be gratefully acknowledged by the Hon. Treasurer, Viscount Esher, at the office of the Lutyens Memorial, 13 Mansfield Street, London, W.1. A list of donors will be published in the first volume.

I am,
Yours faithfully,
JASPER RIDLEY,
Chairman,
Lutyens Memorial Committee.

HENRY YEVELE

Half Moon Cottage,
Little Bookham, Surrey.

The Editor, THE JOURNAL R.I.B.A.

SIR,—I feel that Professor Knoop's very trenchant criticism of what he terms my "romantic biography" calls for immediate rejoinder.

Exception is taken to the fact that I "constantly see Yevele as architect rather than as mason"; but this is indeed the kernel of my book, and in so far as I have attempted to base my contention upon stylistic rather than documentary evidence, I have gone into sufficient detail to provide a basis for further discussion. Besides, it would have been an impertinence on my part to offer a new study of Yevele the stone-mason, after the authoritative treatment of this aspect of his life by Professor Knoop himself, in collaboration with Mr. G. P. Jones.

In my view, Yevele's career is primarily that of an architect, and one of supreme greatness, and while I am prepared for differences of opinion as to the merits of this or that work, the positive evidence of the buildings themselves would prove my case, even had the documentary records perished *in toto*. The existence of this great master could be deduced from his surviving works, which are as outstanding in the history of English architecture as the literary remains of Chaucer in that of our language. But the documentary evidence for Yevele's architectural position goes beyond the "one or two occasions late in his career" which Professor Knoop admits: as soon as Yevele became King's Master Mason in 1360 he was named "devisor of masonry," a term which Professor Knoop has elsewhere admitted to be equivalent to "architect" (1).

I regard Yevele's eminence as an architect not as probable, but as proven: the well-known views of Lethaby, endorsed by Dr. Coulton (2) have long been accepted, and Professor Knoop himself in a recent book (3) states, from the point of view of the economic historian, conclusions very similar to those arrived at by the architect and art-historian Lethaby. Since Professor Knoop regards my picture of a fourteenth-century mason-architect as unreliable, I will here quote a few relevant passages from his own book (4):

"There were obviously big differences in the standing of different master masons"; "It is quite possible that a certain number of boys and youths, after finishing their schooling, may have qualified as masons"; "on more than one occasion master masons were responsible for keeping building accounts, so that some masons at least had enjoyed some schooling and received a grounding in arithmetic and geometry before they entered the trade. It was probably from among these more educated masons that the mason-architects of the Middle Ages ultimately sprang"; "A study of the careers of mediæval master masons shows that they were men of standing, occupying positions quite in keeping with those of professional men, much more like architects than foreman masons."

I believe that the average reader would get substantially the same impression from reading this section of Professor Knoop's book as from the relevant sections of *Henry Yevele*. For my more definite assumption of "professional" status for such great craftsmen as Yevele, I have given ample warranty elsewhere (5) and I hope to publish a detailed review of the evidence for mediæval architectural education as soon as the paper situation permits. Here I will simply remark that there is evidence of literacy, of knowledge of languages and of wide travel on the part of "architects" from the thirteenth to the sixteenth century. As to geometry, fourteenth-century lierne vaulting is as eloquent as the masons' own claim to that science (6), while Lydgate tells us (7):

"*By crafft of Ewclyde mason doth his cure,*
To suwe heos mooldes ruyle, and his plumblyne."

In the first sentence of *Henry Yevele* I warn the reader that the book is not intended for historians and archæologists, but for architects and the general public. This should absolve me from any duty of constantly repeating minor qualifications of "may," "must" and "will have been" in narrating the main story of Yevele's life, which is, as Professor Knoop agrees, well documented. I have not stated as a fact any matter where the combination of documentary and structural evidence is not overwhelming. (*Bona fide* E. & O.E., of course!)

Chapter I, on which Professor Knoop dwells longest, contains scrupulous warnings throughout as to the conjectural nature of the material: but I would emphasise the fact that strong presumptive evidence is offered for the first time as to Yevele's origin, and that this affords a new opening for future research. It is hardly likely that Yevele received his training in London, for after the Black Death the King had to send to Canterbury to obtain the services of Master John Box, while Master John atte Grene almost certainly came from Ely Minster. Henry Yevele and his brother Robert, I suggest, survived the plague in the provinces and then took advantage of the shortage of craftsmen in the metropolis to set up in business, quite probably as contractors and monumental masons.

Master craftsmen were treated and described as gentlemen, and there is a growing body of evidence suggesting that they formed a largely hereditary and social hierarchy, fairly difficult for the ordinary journeyman to enter. Neither Richard Beke nor Christopher Horner attained a status even approaching that of such first-rank masters as Yevele, Wynford, or Hugh Herland. That Yevele in later years did in fact enjoy a large private practice (as did many other first-class craftsmen in the royal service before and after), is proved by the documents, and each new discovery tends to increase rather than to decrease its scope; Yevele's apparently unlimited "spare time" was the accustomed attribute of the highest genius.

(1) D. Knoop and G. P. Jones: *An Introduction to Freemasonry*, 1937, pp. 21-22.
(2) G. G. Coulton: *Art and the Reformation*, 1928, pp. 78-9, 504.
(3) D. Knoop and G. P. Jones: *op. cit.*, esp. pp. 20-28.
(4) *Ibid.*, pp. 21, 22, 23, 27.
(5) Cf. my papers "The Mediæval Carpenter and his Work as an Architect" in this *Journal*, 3rd Series, vol. 45, No. 15, 1938, pp. 733-43; "The Mediæval Office of Works," in *Journal* of the Brit. Archæol. Assoc., 3rd Series, vol. VI, 1941, pp. 20-87, especially Appendixes F and G.
(6) The *Regius* and *Cooke* MSS., published in D. Knoop, G. P. Jones, and D. Hamer: *The Two Earliest Masonic MSS.*
(7) *The Minor Poems of John Lydgate*, ed. H. N. MacCracken, II, 1934, p. 802. ("Every thing to his Semblable," 35, 36).

JOHN H. HARVEY.

Notes

NOTES FROM THE MINUTES OF THE COUNCIL

12 DECEMBER 1944

Appointments

Representative of the Northern Architectural Association on the R.I.B.A. Council:

Major S. W. Milburn, M.B.E., M.C. [*F.*] in place of Mr. R. Norman Mackellar [*F.*].

R.I.B.A. Code of Practice Committee on Finishings:

Mr. Ewen S. Barr [*F.*] in place of Mr. G. Grey Wornum [*F.*].

British Standards Institution:

Technical Committee on Wood Lathing: Lieut.-Col. George Whittaker, O.B.E. [*F.*].

Technical Committee on Sundry Fixing for Building Purposes: Mr. R. Sheppard [*A.*].

Conference on Standard Colours for Kitchen Equipment: Mr. H. E. Moss [*F.*].

Relationship between Men's and Women's Salaries

The Council approved for submission to the Royal Commission on Equal Pay a statement of evidence prepared by the Salaried Members' Committee supporting the principle of equal pay for equal work in regard to employment in the fields of architecture and town planning.

Competitions involving Special Methods of Construction and Special Materials

The Council approved a recommendation of the Competitions Committee that a clause should be added to the R.I.B.A. Competition Regulations stipulating that promoters of competitions involving the use of new methods of construction or new materials should be required to satisfy the R.I.B.A. that they are satisfactory, and that where in such a competition the successful competitor is not called upon to supervise the erection of the building, provision should be made to safeguard him adequately against any legal responsibility for construc-

tional or other defects which may arise if the building is erected, which responsibility must remain with the promoters.

Conference on Preservation of Buildings of Architectural or Historical Importance convened by the C.P.R.E.

It was reported that Mr. Edward Maufe [*F.*] and Mr. John Summerson [*A.*] had been appointed by the War Executive Committee to act as representatives of the R.I.B.A. at a Conference on this subject to be held on 18 December 1944, convened by the Council for the Preservation of Rural England.

Gift of Books to the R.I.B.A. Library

The thanks of the Council have been conveyed to Miss J. O. S. Elgood, who has presented to the R.I.B.A. Library a number of valuable books from the library of her late uncle, Mr. George S. Elgood, R.I.

R.I.B.A. Ralph Knott Memorial Maintenance Scholarship, 1944-1945

It was reported by the Board of Architectural Education that this scholarship, held by Miss A. P. Broughton, had been renewed for the Session 1944-1945.

R.I.B.A. (Donaldson) Medal at the Bartlett School of Architecture, University of London, 1943

It was reported by the Board of Architectural Education that notification had been received from the Registrar of the University College, London, that the R.I.B.A. (Donaldson) Medal for 1943 has been awarded to Miss Joan L. Hyland.

Obituary

The Acting Secretary reported with regret the death of the following members and Student :

Thomas Barron, *Hon. Associate*
Henry Gilbert Gamble [*F.*].
Nathaniel William Harrison [*F.*].
George Taylor Hyde [*F.*].
James Cumming Wynnes [*F.*].
Arnold Mitchell [*Retd. F.*].

Mr. Mitchell was Soane Medallist, 1885, and Institute Medallist (Drawings) 1886, and a past member of the Council.

Robert Bernard Verdon [*A.*]. Killed on active service.
Vernon Stuart Barnes [*L.*].
Arthur Stanley Frost [*L.*].
William Angus King [*Student*]. Killed on active service.

Messages of sympathy have been conveyed to their relatives.

Membership

Fellowship :

The Council by unanimous vote elected the following architect to the Fellowship under the powers defined in the Supplemental Charter of 1925 :

Mr. Ronald Frederick Richard Day [*A.*] (Cape Town).

Membership :

The following members were elected :

As Hon. Fellows (3), as Fellows (10), as Associates (35), as Licentiates (10).

Election, January 1945 :

Applications for election were approved as follows :

As Fellows (4), as Associates (6), as Licentiates (7).

Election, April 1945 :

One application for election as an Associate from an overseas candidate was also approved.

Reinstatements :

The following ex-members were reinstated :

As Associates : John Raymond Bell
Norman William Johnson
William Stanley Minty
Douglas Rogers Stark
John Steel
William Caie Walker

As Licentiate : Douglas Harold Payne

Resignations :

The following resignations were accepted with regret :

Miss Caroline Cary Gilson [*A.*].
Philip Bowden [*Retd. L.*].

Applications for Transfer to the Retired Members' Class under Bye-law 15 :

The following applications were approved :

As Retired Fellows :
Arthur Christopher Goulder.
Henry Blinman Mackenzie

As Retired Licentiates :
George Thow Smith
William Job Warde

Applications for Transfer to the Retired Members' Class under Bye-law 15

The following members were transferred to the Retired Members' Class under Bye-law 15 :—

As Retired Fellow : Ernest Hadden Parkes.
As Retired Associate : John Moir Kennrad.
As Retired Licentiate : Edgar Stevens.

Membership Lists

ELECTION : 14 DECEMBER 1944

The following candidates for membership were elected in December 1944.

AS HON. FELLOWS (3)

FRASER : THE RT. HON. PETER, P.C., M.P., Prime Minister of New Zealand. Wellington, New Zealand.

KING : THE RT. HON. WILLIAM LYON MACKENZIE, P.C., M.P., LL.D., F.R.S.C., Prime Minister of Canada. Ottawa, Canada.

SMUTS : FIELD-MARSHAL THE RT. HON. JAN CHRISTIAAN, P.C., C.H., K.C., D.T.D., Prime Minister of South Africa. Irene, South Africa.

AS FELLOWS (10)

BENSON : ERIC SKIPWORTH [*A.* 1935], Manchester.
JENSON : ALEXANDER GEORGE [*A.* 1922].
MINOPRIO : ANTHONY, M.A., B.Arch., A.M.T.P.I. [*A.* 1925].
PHILLIPS : RONALD ALFRED, Major R.E. [*A.* 1928], Bournemouth.
SPENCELY : HUGH GREVILLE CASTLE [*A.* 1929].
TURNBULL : BERNARD WILLIAM [*A.* 1921].
WALLACE-BATEMAN : ROBERT, Major, M.C., C. DE G. [*A.* 1921], Redruth.

And the following Licentiates who have passed the qualifying Examination :—

DUDDING : JOHN WALTER MACKENZIE, Nottingham.
JONES : JOHN HAROLD, Birmingham.
PALMER : ELIAS WILLIAM, Major.

AS ASSOCIATES (34)

COLLINS : ROBERT, Sunderland.
COLLYER : WILLIAM, Edinburgh.
COOPER : GEORGE, Pelsall, Staffs.
COUCH : MISS BERYL STANLEY, Southport.
DESSAU : HEINZ.
EDWARDS : ARTHUR MIDDLETON.
ELLIOTT : EDWARD PROCTER, B.Arch. (Hons.) L'pool, Barnsley.
ESSLEMONT : GORDON STANSFIELD, Oldmeldrum.
FREESTON : THOMAS ANDREW, Cardiff.
GREENFIELD : LEWIS BEVIL GODWIN.
GREGORY : FREDERICK WILLIAM, Birmingham.
GROSE : WILLIAM PETER JACKSON, Truro.
GROVE : DONALD EDWARD, Birmingham.
HOBBIS : CHARLES IREDALE.
HODGSON : FREDERICK ARCHIBALD, Carlisle.
HOYLES : FRED HORNBY, Bury.
LANDAW : DAVID.
MACLAUGHLIN : MISS MARY TERESA, B.Arch., Dublin.
MILLS : KENNETH SYDNEY, Dip. Arch.
MITCHELL : WILLIAM PORTER, Blackburn.
MOYA : JOHN HIDALGO.
PARKER : CYRIL ANTONY, Lincoln.
PHILLIPS-HOWARD : BASIL ADRIAN.
SMITH : ERIC SIDNEY.
SOUTHALL : REGINALD EDWARD JOSEPH, Kidderminster.
SPARROW : RONALD JAMES, Colchester.
STEDHAM : RONALD ARTHUR, Carlisle.
TAYLOR : ALASTAIR ANDERSON, Bothwell.
THOMAS : WILLIAM STEPHEN, Newport, Mon.
WARD : ARTHUR NEVILLE, B.Arch.Hons., Warrington.
WARING : ARNOLD SHAW, Southampton.
WILSON : GRANVILLE HOWARD, Birmingham.
WORTHINGTON : CLIFFORD, Chichester.
WRIGHT : FREDERICK, Aberdeen.

AS LICENTIATES (10)

CLOKE : DONALD GEORGE WILLIAM, Bournemouth.
HALTON : LESLIE FRANK.
HAND : WILLIAM REGINALD, Major R.E.
JOHNSON : THOMAS RANSFORD, Wolverhampton.
JOLLEY : THOMAS RICHARD, Northampton.
LODGE : FRANCIS GRAHAM.
OLDHAM : CHARLES HENRY HUGHES, Swinton.
PERCY : STANLEY FRANK.

WARREN : GEORGE ARCHIBALD.
WATT-LOW : ARTHUR MACKENZIE, Rutherglen.

ELECTION : 13 FEBRUARY 1945

An election of candidates for membership will take place on 13 February 1945. The names and addresses of the candidates, with the names of their proposers, found by the Council to be eligible and qualified in accordance with the Charter and Bye-laws are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Saturday, 10 February.

The names following the applicant's address are those of his proposers.

AS FELLOWS (8)

CLARKE : EDMUND BLAYNEY [*A.* 1893], 24 Purley Knoll, Purley, Surrey. L. S. Sullivan, Briant Poulter, and C. H. Murray.

COX : FRANK RUSSELL [*A.* 1931], Sheep Street, Burford, Oxon ; Blanket Hall, Witney. R. F. Jordan, W. H. Godfrey, and Thomas Rayson.

MAUNDER : FRED ALLARD CHARLES, Dip.Arch.Durham (Rome Scholar in Architecture 1934) [*A.* 1934], Deputy City Architect, Municipal Offices, Royal Beach Hotel, Southsea, Portsmouth ; Little Denmead Farmhouse, Denmead, Portsmouth. Prof. R. A. Cordingley, A. C. Townsend, and R. A. Thomas.

RICHMOND : SIDNEY MARK [*A.* 1932], City Architect's Department, 18 Cloth Market, Newcastle-upon-Tyne ; 35 Denewell Avenue, Newcastle-upon-Tyne, 7. R. G. Roberts, F. C. Webster, and J. E. Shaw.

And the following Licentiates who are qualified under Section IV Clause 4 (*c*) (ii) of the Supplemental Charter of 1925 :—

CLAYTON : ARTHUR, Duchy Chambers, Clarence Street, Manchester ; Sarn, Hollin Lane, Styal, Cheshire. Francis Jones, J. S. Beaumont, and P. G. Fairhurst.

HILL : ROBERT SHARPE, 22 Sydenham Avenue, Belfast. T. W. Henry, John Seeds, and R. S. Wilshere.

SCARLETT : ALFRED BENJAMIN, War Damage Commission, Liverpool ; 37 Shrewsbury Drive, Upton, Wirral, Cheshire. H. J. Rowse, Rupert Medcalf, and J. R. Mewton.

SHEARER : JAMES, A.R.S.A., 11 Maygate, Dunfermline ; Morton Lodge, Dunfermline. A. H. Mottram, Alexander Wright, and Jos. Weekes.

AS ASSOCIATES (8)

The name of a school or schools after a candidate's name indicates the passing of a recognised course.

CLOKEY : THOMAS (Capt. R.E.) (Univ. of Liverpool), Belgrave Court, 55-57 Belgrave Road, S.W.1. Prof. L. B. Budden, J. E. Marshall, and applying for nomination by the Council under Bye-law 3 (*d*).

CROWE : RALPH VERNON (Capt. R.E.) (Arch. Assoc.), 11A St. Andrew's Road, Bedford. C. S. White, J. M. Easton, and Howard Robertson.

HODSMAN : MISS BETTY DALTON, Dip.Arch.Leeds (Leeds Sch. of Arch.), Dalton House, 6 Roydstone Road, Bradford. Wm. Broadbent, Victor Bain, and W. F. Dawson.

MERRILL : ALFRED (Special War Exam. 1921), 21 Charterhouse Road, Orpington, Kent. Stanley Heaps, Dr. Charles Holden, and Thomas Bilbow.

PETER : MISS MARIE PAULINE, Dip.Arch.Leeds (Leeds Sch. of Arch.), 3 Green Lane, Selby, Yorkshire. Wm. Broadbent, Victor Bain, and W. F. Dawson.

PHILLIPS : HAROLD VERNON SEWARD (Birmingham Sch. of Arch.), 334 Selly Oak Road, King's Norton, Birmingham 30. George Drysdale, Herbert Jackson, and T. M. Ashford.

TAYLOR : WILLIAM (Arch. Assoc.), 48 The Ridings, Surbiton, Surrey. Fredk. Gibberd, George Fairweather, and G. A. Jellicoe.

THOMPSON : Major JOHN SEYMOUR, Dip.Arch. (Univ. of Liverpool), c/o Midland Bank Ltd., 4-6 Dale Street, Liverpool, 2. Prof. L. B. Budden, J. E. Marshall, and H. Thearle.

AS LICENTIATES (19)

AMY : HEDLEY JAMES YOLE, A.M.T.P.I. (Capt. R.E.). Formerly, Senior Planning Assistant, Leeds City Corporation. 49 Parkland Drive, Leeds, 6. Applying for nomination by the Council under Bye-law 3 (*d*).

ATKIN : SAMUEL PILGRIM, Architect's Department, L.C.C., County Hall, S.E.1 ; 21 Welham Road, Mitcham Lane, Streatham, S.W.16. J. W. Hepburn, R. Wilson, and Edwin Williams.

BAILEY : GEORGE FREDERICK, Architect's Department, L.C.C., County Hall, S.E.1 ; 7 St. Saviour's Road, Brixton Hill, S.W.2. J. W. Hepburn, R. Wilson, and Edwin Williams.

CALDWELL : IAN, Lincoln and District Planning Office, The Castle, Lincoln. Lt.-Col. J. S. Curwen, F. H. Walker, and H.S. Sawyer.

CARROLL : STANLEY EDWARD, Council Offices, Weeley ; Bentley Road, Weeley Heath, Nr. Clacton-on-Sea. D. W. Clark and the President and Hon. Secretary of the Essex, Cambridge and Herts. Soc. of Archs. under Bye-law 3 (*a*).

CLIVE : ROBERT MCMILLAN, Education Offices, Stranraer ; "Eldrick," Stoneykirk Road, Stranraer. J. A. Coia, W. J. Smith, and Jos. Weekes.

DUNN : LESLIE JAMES (Major R.E.), Grosvenor House, 70 Seaside, Eastbourne. Joseph Emberton, W. F. Granger, and Alister MacDonald.

FOX : CHARLES EDWARD, Messrs. Holtom & Fox, Bond Street, Dewsbury ; "Belvedere," Boston Spa, Yorkshire. The President and Hon. Sec. of the West Yorks. Soc. of Arch. under the provisions of Bye-law 3 (*a*) and applying for nomination by the Council under Bye-law 3 (*d*).

GILLO : ROBERT SEWARD, Architect's Department, Fulham Borough Council, S.W.6 ; 17 Balmuir Gardens, Putney, S.W.15. R. J. Harrison, and applying for nomination by the Council under Bye-law 3 (*d*).

JACK : THOMAS, 19 Park Circus, Glasgow, C.3 ; 30 Hamilton Park Avenue, Hillhead, Glasgow, W.2. W. J. Smith, A. G. Henderson, and Jos. Weekes.

JOHNS : JOHN HEAMANS, Civil Engineer in Chief's Department, H.M. Dockyard, Portsmouth : "Horwood Orchard," North Hayling, Hayling Island, Hants. E. J. Thomas, V. G. Cogswell, and C. G. Stillman.

JOHNSTONE : ALEXANDER WILLIAM, Messrs. The Fine Cotton Spinners and Doublers Association, Ltd., 6 St. James's Square, Manchester ; 42 Thornhill Road, Heaton Mersey, Manchester. Applying for nomination by the Council under Bye-law 3 (*d*).

LOTT : WILFRED HENRY, Chief Engineer's Department, Gas Light & Coke Co., S.W.1 ; 44 Crescent Way, Norbury, S.W.16. Sidney Loweth, Robert Atkinson, and A. F. B. Anderson.

PORTWOOD : VALENTINE THOMAS HENRI, Estate Department, L.M.S. Rly. Headquarters, The Grove, Watford, Herts. ; 14 Sandringham Road, Northolt, Middlesex. W. H. Hamlyn, Harry Holland, and applying for nomination by the Council under Bye-law 3 (*d*).

SHANNON : HAROLD JAMES, Architect's Department, L.C.C., County Hall, S.E.1 ; 55 Cannon Hill Lane, Merton Park, S.W.20. Cecil Kennard, Edwin Williams, and W. J. Durnford.

STEPHENS : CLIFFORD HENRY, c/o Alec. F. French, Esq., Halifax House, St. Augustines Parade, Bristol, 1 ; 37 Henleaze Road, Henleaze, Bristol. A. F. French, R. C. James, and C. F. W. Dening.

WEST : RICHARD HAROLD, County Architect's Department, Park Street, Taunton, Somerset ; 70 Priory Avenue, Taunton. H. S. W. Stone, A. J. Toomer, and E. C. Francis.

WILD : CLIFORD, Bridge Street Chambers, 72 Bridge Street, Manchester, 3 ; "Grasscroft," 188 Park Road, Timperley, Cheshire. Ernest Ogden, H. T. Seward, and H. H. Smith.

WINGATE : JOHN BASDEN (Capt.). Formerly, Westbourne Crescent, Bearsden, Dumbartonshire ; Mill Hill House, Prestwick, Aryshire. James Miller, C. E. Monro, and Alexander Wright.

ELECTION : 1 MAY 1945

An election of candidates for membership will take place on 1 May 1945. The names and addresses of the overseas candidates, with the names of their proposers, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Saturday, 28 April 1945.

The names following the applicant's address are those of his proposers.

AS FELLOW (1)

MACARTNEY : ROBIN HALLIDAY [*A.* 1936], Public Works Department, Nicosia, Cyprus. Howard Robertson, G. A. Jellicoe, and A. F. B. Anderson.

AS ASSOCIATE (1)

AGG : ARTHUR DESMOND (Special Final Exam.), c/o Public Works Department, Lusaka, Northern Rhodesia. Major P. N. Logan, Capt. J. R. Hobson, and J. D. Robertson.

Competitions

COMPETITION RESULT

Dartington Hall : Cottages

1. Grenfell Baines Group (Preston).
2. Courtenay M. Crickmer [*F.*].

First prize for competitors in H.M. Forces, F/o R.A. de Yarburgh Bateson [*A.*].

Five prizes of £20 to the following :
Sgt. Frederick Hill [*A.*], R.A.F.
A. G. Gordair [*A.*] (Southsea).
L/Sgt. G. G. Cooke [*A.*], R.E.
G. A. Bazeley [*A.*] and Guy Aldis [*A.*] (Penzance).
Lt. Frank Risdon [*A.*], R.N.V.R.

CRYSTAL PALACE COMPETITION

The Trustees of the Crystal Palace and the Council for the Encouragement of Music and the Arts (C.E.M.A.) invite architects and town-planners to submit designs for the development of the Crystal Palace Grounds, London, S.E.19.

Assessors : Prof. Sir Patrick Abercrombie [*F.*]
Dr. Charles Holden [*F.*]
Mr. Alister MacDonald [*F.*]
Mr. Lewis Silkin, M.P.
Sir Kenneth Clark, K.B.E.

Premiums £2,000, £750, £500, and a further sum of £500 may be awarded at the discretion of the Assessors.

Applications for the Conditions should be addressed to the Promoters, The Crystal Palace, S.E.19. The various dates in connection with the competition will be published later.

Notices

INFORMAL MEETING

TUESDAY, 13 FEBRUARY 1945

An Informal Meeting will be held on Tuesday, 13 February 1945, at 5.30 p.m., when Mr. H. S. Goodhart-Rendel (Past-President) will read a paper on " The Work of the late Sir Edwin Lutyens."

R.I.B.A. KALENDAR 1944-45

A Kalendar in a modified form has been published and copies are now being despatched to Members and Students and should be in their hands by the end of this month.

All changes in membership up to 31 July 1944 have been included, but it has not been possible to include changes of address since December, 1943.

The delay in publication is much regretted, but it has been unavoidable owing to Government priority work having had first claim on the limited staff of the printers.

ELECTION 16 FEBRUARY 1943

The election of F. A. Walker as an Associate which was announced in the March 1943 *Journal*, has been declared void.

ANNUAL SUBSCRIPTIONS

Members' subscriptions, Students' and Subscribers' contributions became due on 1 January 1945.

The amounts are as follows :—

Fellows	£5 5 0
Associates	£3 3 0
Licentiates	£3 3 0
Students	£1 1 0
Subscribers	£1 1 0

NOTE.—By a resolution of the Council dated 20 July 1931 the subscriptions of R.I.B.A. members in the transoceanic Dominions who are also members of Allied Societies in those Dominions are reduced to the following amounts as from 1 January 1932 :—

Fellows	£3 3 0
Associates	£2 2 0
Licentiates	£2 2 0

Members who are already registered under the Architects' Registration Act 1931 are reminded that the annual renewal fee of £1 became due on 1 January 1945, and should be forwarded DIRECT to the *Registrar, The Architects' Registration Council*, 68 Portland Place, W.1.

COMPOSITION OF SUBSCRIPTIONS FOR LIFE MEMBERSHIP

Fellows, Associates and Licentiates of the Royal Institute may become Life Members by compounding their respective annual subscriptions on the following basis :—

For a Fellow by a payment of £73 10s. (70 guineas).

For an Associate or Licentiate by a payment of £44 2s. (42 guineas), with a further payment of £29 8s. (28 guineas) on being admitted as a Fellow.

In the case of members in the transoceanic Dominions who are members of Allied Societies in those Dominions, the following basis will operate :—

For a Fellow by a payment of £52 10s. (50 guineas).

For an Associate or Licentiate by a payment of £31 10s. (30 guineas), with a further payment of £21 (20 guineas) on being admitted as a Fellow.

Provided always that in the case of a Fellow or Associate the above compositions are to be reduced by £1 1s. per annum for every completed year of membership of the Royal Institute after the first five years, and in the case of a Licentiate by £1 1s. per annum for every completed year of membership of the Royal Institute, with a minimum composition of £6 6s. in the case of Fellows and £4 4s. in the case of Associates and Licentiates.

Members' Column

APPOINTMENTS

MR. E. R. CHILTIN, [*A.*], A.M.T.P.I., has been appointed Planning Officer for the County of Kincardine.

MR. T. ALWYN LLOYD [*F.*], P.P.T.P.I., of Cardiff, has been appointed a member of the Central Advisory Council for Wales set up under the new Education Act.

MR. W. D. LOUGHER-GOODEY [*A.*] has been appointed the Assistant Planning Officer to the County of Londonderry, taking up his duties on 1 February.

PRACTICES AND PARTNERSHIPS

MR. W. W. SCOTT-MONCRIEFF [*F.*] is now practising at Horham, Diss, Norfolk, and would be glad to receive current trade catalogues, especially insulated continuous burning solid fuel cookers and heaters suitable for housing schemes.

ELDERLY FELLOW desires suitable partner.—Box 1-3, Northfield Terrace, Plymouth.

MR. A. STANLEY ROBERTS [*F.*] has returned to practice at 19 Hanover Square, London, W.1.

MR. R. A. RONCETTI [*L.*] has returned to practice at 3 Princes Square, Harrogate, and would be pleased to receive trade catalogues.

MR. FRANK BETHELL [*L.*] and MR. CHAS. M. SWANNELL [*F.*], lately of Victoria House, Southampton Row, W.C.1, have by mutual consent dissolved their partnership as from 29 September 1944. Mr. Chas. M. Swannell will continue to practise from No. 6, Raymond Buildings, Gray's Inn, W.C.1. Telephone No.: Holborn 1503.

HARRY WEBSTER [*A.*], Dip. Arch. (Leeds) has commenced practice at No. 8, Upper Fountaine Street, Albion Street, Leeds, 2, and would be glad to receive trade catalogues and samples.

THE partnership which hitherto existed between Mr. H. L. Mullett [*L.*] and Mr. D. C. Denton-Smith [*L.*] has now been dissolved. The practice will continue to be carried on by Mr. Denton-Smith at 40 Regent Street, Cambridge. Tel. No. 3989.

FELLOW with office in Sussex country town wishes to meet another architect with view to partnership in re-establishment of practice. Capital to share expenses of initial period essential.—Box 1412, c/o Secretary R.I.B.A.

ASSOCIATE, age 34, ex-capt. R.E., invalided out, would like to communicate with Firm or Group of Architects with view to partnership; capital available.—Reply Box No. 3145, c/o Acting Secretary, R.I.B.A.

ACCOMMODATION

MEMBER vacating his office in the West Central (London) district, is desirous of contacting another Member with an established office, not necessarily in the same district, who is prepared to share accommodation and telephone facilities on agreed terms.—Write Box No. 2812, c/o Secretary R.I.B.A.

WANTED

ARCHITECT starting private practice desires to purchase office furniture, desks, chairs, filing cabinets, etc. Also drawing office equipment.—Reply Box No. 1312, stating price.

WANTED.—Banister Fletcher's *History of Architecture*, 9th edition or later.—Seward, 14 Newton Grove, London, W.4.